DECEMBER 13th, 1945

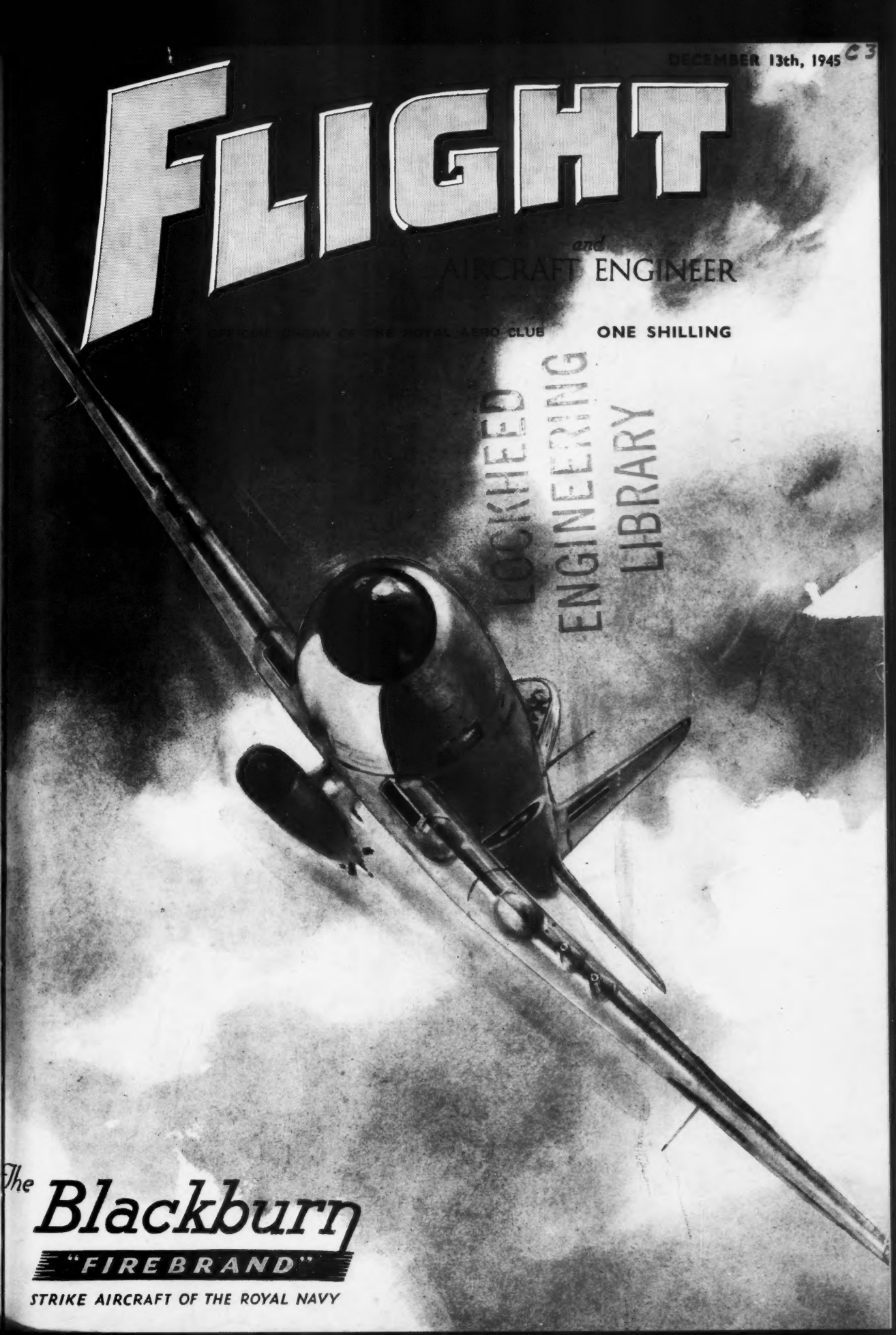
FLIGHT

and AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

ONE SHILLING

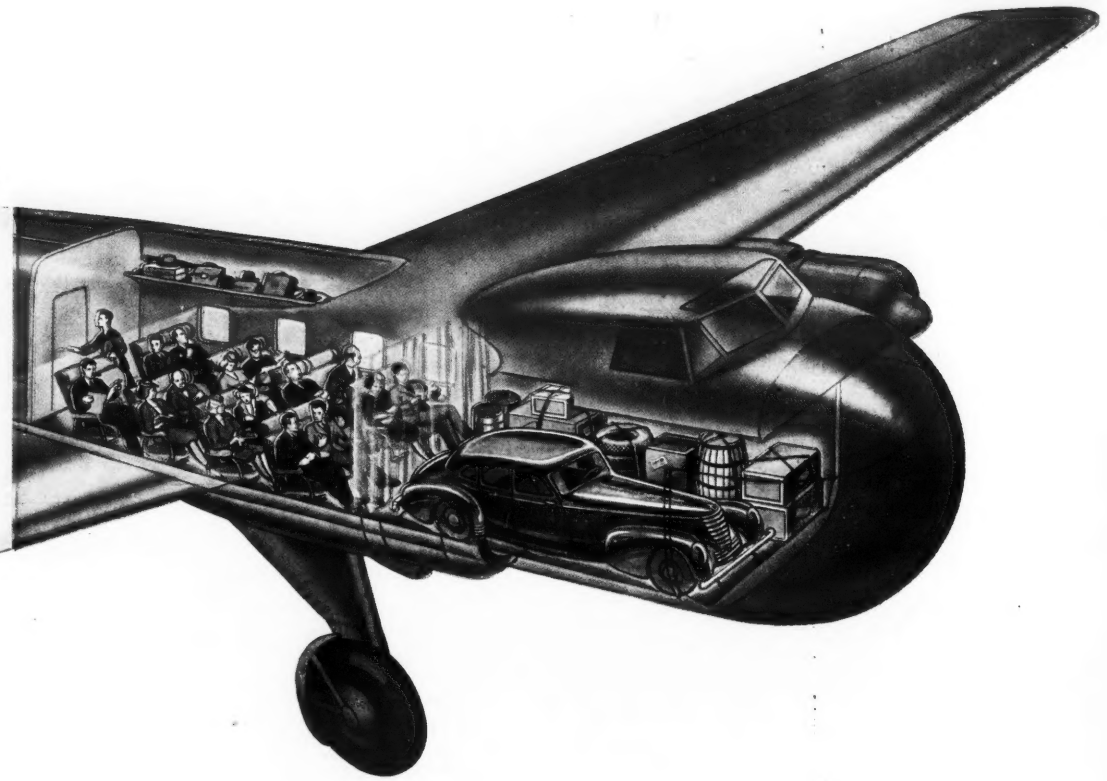
LOCKHEED ENGINEERING LIBRARY



The Blackburn
"FIREBRAND"
STRIKE AIRCRAFT OF THE ROYAL NAVY

Versatility . . .

With design versatility making it readily adaptable to any specialised service or project, the "Bristol" Freighter puts luxury air transportation within the financial range of an entirely new strata of potential users. The FREIGHTER version of Type 170 has readily detachable seating for up to 40 passengers . . . providing variable accommodation for differing ratios of combined passenger/cargo payload, thus giving the aircraft optimum versatility. This, combined with inherent features ensuring operational economy and minimum maintenance, makes the Freighter the soundest aircraft proposition for popular air-travel and cargo-carrying.



"Bristol"

THE BRISTOL AEROPLANE COMPANY LIMITED

FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editor
C. M. POULSEN

Managing Editor
G. GEOFFREY SMITH, M.B.E.

War Correspondent
JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: GUILDHALL BUILDINGS, NAVIGATION ST. Telegrams: Autopress, Birmingham. Telephone: Midland 2971 (5 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412.
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe, Glasgow. Telephone: Central 4857.

SUBSCRIPTION RATES: Home and Abroad: Year, £3 1 0. 6 months, £1 10 6.

Registered at the G.P.O. as a Newspaper.

No. 1929. Vol. XLVIII. December 13th, 1945 Thursdays, One Shilling.

The Outlook

"The Navy That Flies"

IMPORTANCE far transcending the actual event attaches to the completely successful landing-on and taking-off trials of the de Havilland Vampire held on December 3rd. We have previously commented on the new spirit which has lately animated the Royal Navy so far as its air arm is concerned. The Vampire trials provide one further proof of this progressive spirit. Gone are the days, for ever we hope, when the aircraft of the Navy were ridiculously inferior to comparable land-based types. The 1945 "Navy That Flies" bears little external resemblance to that so incomparably depicted by "Bartimeus" 30 years ago. The *esprit de corps* is the same, but with the essential difference that it is now shared by the Admiralty.

The process has been a long one, a slow one, and in many ways a painful one, but there is now in the highest Admiralty circles an appreciation of the part to be played by the air which was sadly lacking during and after the first world war. Whatever the future may hold in naval strategy, the Royal Navy is obviously determined never again to be left behind in the application of the latest forms of air weapon. If one may take history as a guide, the slowness with which the Navy adopts new ideas is not altogether a bad thing. The sailor has always resisted newfangled notions. He resisted steam; he resisted the submarine; he resisted the turbine; he has resisted the air. But when he is finally convinced that some new development is a good thing, he has a knack of turning it to account, and in the end he will work it in a way which must arouse admiration in the unbiassed observer. The Vampire trials were an excellent example of this characteristic, and they were more than that in that for once the Navy was first instead of being a late starter. The American Ryan Fireball was, of course, landed-on some time ago, but that machine has a Wright Cyclone radial piston engine in the nose and a jet in the tail, whereas the Vampire is purely jet-propelled.

Jets and Decks

WITH the feasibility of using a jet-propelled aircraft from a carrier demonstrated, the Royal Navy is on at least level air terms with any navy in the world, and it is safe to assume that this is but the beginning. Doubtless other types will follow and improvements be incorporated as experience is gained. The Vampire has a comparatively low wing loading and can thus be taken off without the aid of any form of accelerator. But if higher wing loadings should be deemed desirable, there is already ample experience available in that direction.

The problem of landing-on is somewhat complicated by the relatively slow pick-up of a jet engine. This may be a rather serious drawback in the case of a baulked landing or, as the Navy terms it, a "wave-off." In the Vampire the difficulty has been minimised by fitting extra large drag flaps, which enable the pilot to make his approach on a fair amount of throttle opening so that, if he is "waved-off," he can instantly close his flaps, open his throttle and go round again. Another method, which has, we believe, been developed by Power Jets, is the use of thrust spoilers on the jet. Not only do these enable zero thrust to be achieved, but can even give a certain amount of negative thrust and, should the landing be baulked, the pilot can have full forward thrust instantly without changing his r.p.m.

One disadvantage of using jets on carriers is that the deck is likely to suffer from the heat. Wooden decks appear to be ruled out, and even steel decks may suffer if a jet engine is kept running for long periods. Fortu-

nately, jets do not need the warming-up process so irksome in piston engines.

The advantages of jet-propelled types for carrier work are much more obvious than the difficulties. Apart from the fact that their performance is basically the same as that of land-based types, the low undercarriage made possible by the absence of an airscrew makes it possible to use a tricycle undercarriage, which stops swing and bounce. Moreover, the pilot can be placed in the nose of a single-engined type and thus obtain a fine view instead of having his view cut off at the critical moment by a large engine several feet in front of him. With piston-engined aircraft that has only been possible with twin-engined types.

CONTENTS

The Outlook	621
Two of a Trio	623
German Jet Development	626
The Post-War Gipsy	630
Cockpit Classification	*a-d*
Deck Landing a Sea Vampire	631
In the Air (VI): Hampden and Hereford	634
Here and There	636
Civil Aviation News	638
Lancaster Group Celebrate	640
Correspondence	641
Service Aviation	642

Tail Screws

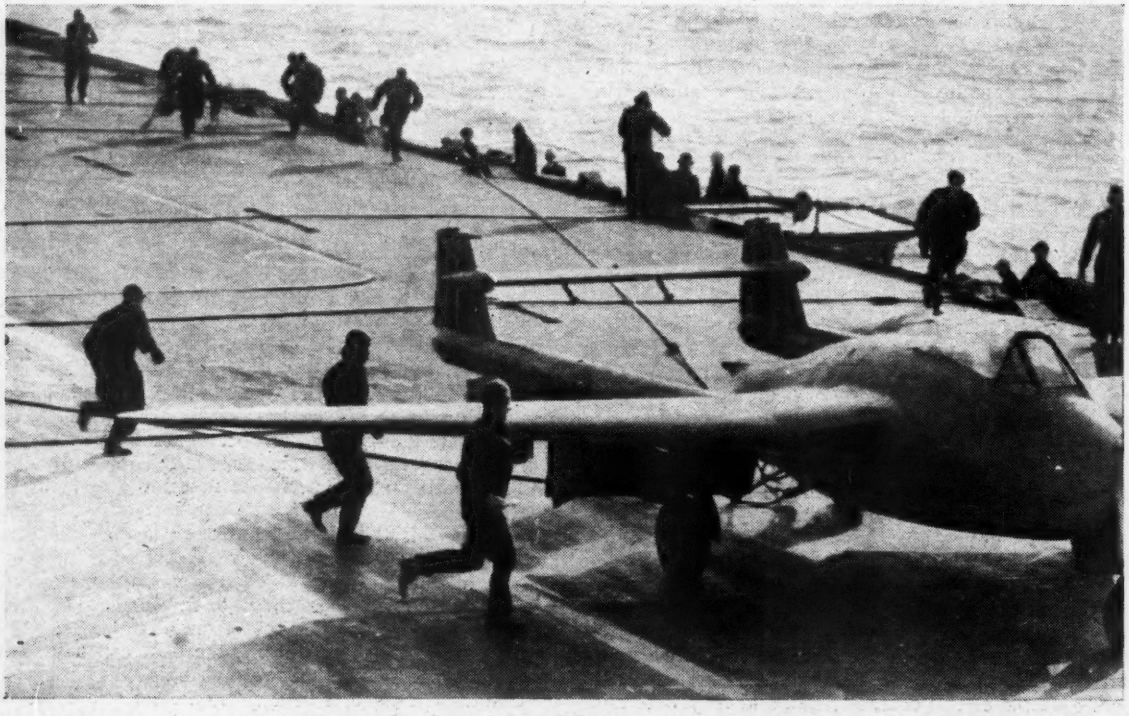
BY flying from Los Angeles to Washington at an average speed of more than 430 m.p.h. the Douglas XB-42 bomber type has drawn attention to a "formula" which the younger generation will regard as new, but which in fact dates back to the very early days of flying. Somewhere around 1911 a small monoplane was exhibited at a Paris aero show with its rotary engine inside the fuselage and the airscrew in the extreme tail.

That the Paulhan-Tatin *Torpille Aerienne*, as it was called, was not a success is not surprising in view of the scant knowledge then available. More surprising is, perhaps, the fact that the scheme should not have been revived until now, when, it may almost be said, it is outmoded by the jet and turbine.

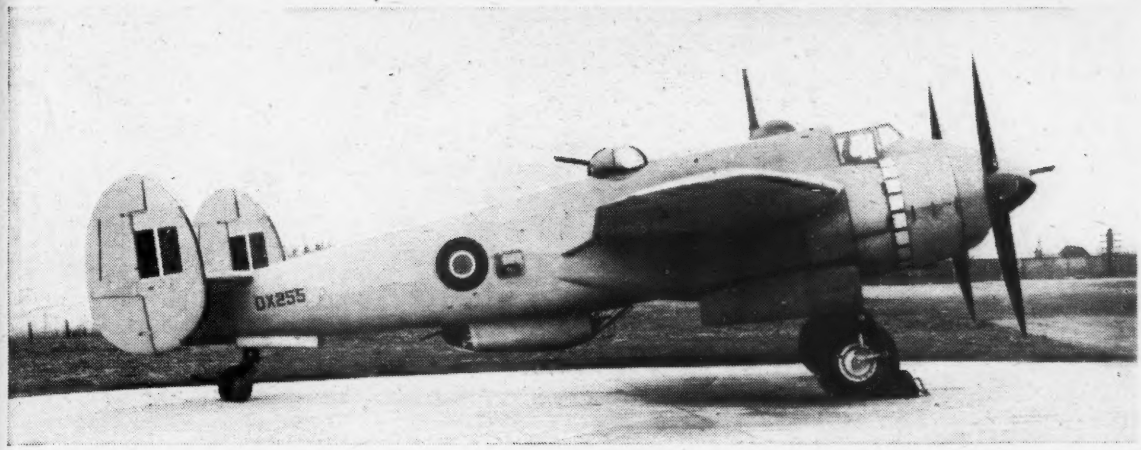
Even allowing for a friendly tail wind during this record flight, the speed of the Douglas bomber is exceptional, and it is doubtful if it could have been obtained with a more orthodox design of comparable size and engine power. The removal of the two Allison engines from the wing must have resulted in a very considerable drag reduction, with a further reduction due to the absence of airscrew slipstreams over the wing. The bomber is a good deal smaller than the DC-8 commercial machine which we described recently (October 11th), notably in the matter of wing span, and the gross weight is 35,600 lb. against the 39,500 lb. of the DC-8, and thus the wing loading is evidently higher, but even so, a speed of around 400 m.p.h. is an indication that the "formula" has certain merits for high speed.

Every advantage gained in aviation is paid for in some way. In this case the price probably takes the form of extra structure weight. Not only is there the long shafting to the airscrews, but the fact that the relieving load of wing engines is lost and turned into a central load must add some extra wing and fuselage weight.

In the commercial version there may be possibilities of noise reduction, partly because the airscrews are in the extreme tail and also by enclosing the fuselage-housed engines in a sound-proofed engine room.



DECELERATION: The Sea Vampire brought to a standstill by the arrester gear on H.M.S. *Ocean*. It is difficult to realise that the Vampire, weighing 8,000 lb., was doing between 90 and 100 m.p.h. when it hooked the wire. (*An eye-witness description of the Sea Vampire deck-landing appears on pages 631-33.*)



Two of a Trio

This side view of the Buckingham (B) I shows clearly the mid-upper turret and the "bath" with bomb sight and two-gun turret.

The Bristol Buckingham Fast Day or Night Bomber and the Brigand Long-range Attack Monoplane

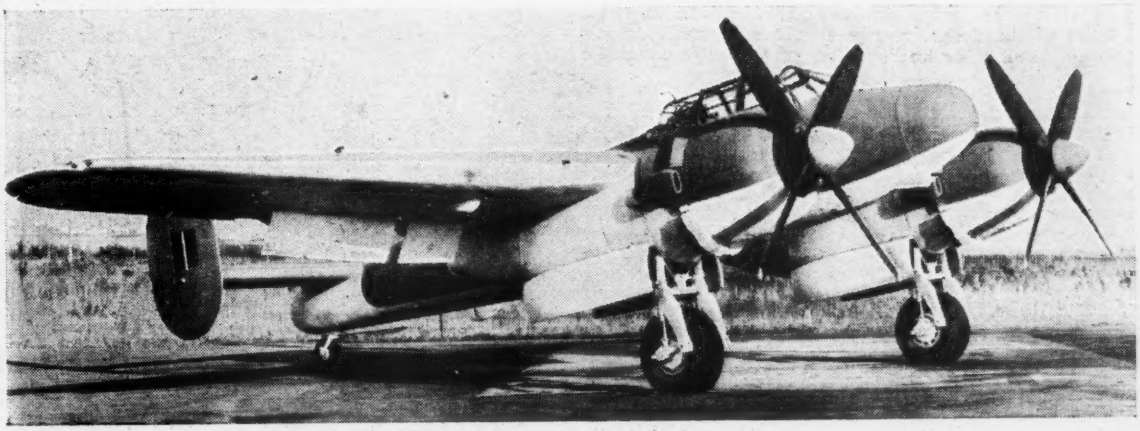
DURING the latter part of the war the Bristol Aeroplane Company produced a trio of aircraft types which represented the logical development of the Blenheim-Beaufighter "theme." One of these three, the type 166 or Buckmaster, was described in *Flight* of October 18th, 1945. It has now become possible to refer to the other two, the type 163 Buckingham and the type 164 Brigand. All are based upon the versatility and performance of the Beaufighter, and in 1940 design investigations had led to a layout for a twin-engined machine based on Hercules engines. During the following year the Air Council issued specification B2/41 which called for a higher performance and a crew of four instead of the three envisaged in 1940. Consequently a new design was started, based upon the Centaurus engine. This, the type 163, later became known as the Buckingham.

A major problem was to provide good view for pilot and navigator/air bomber, only one of whom had a good view in the Beaufort and Beaufighter. In the Buckingham each of the four crew members (pilot, radio operator, mid-upper gunner and navigator/air bomber) occupies a separate section of the fuselage and there is free access between their stations in emergency. The later radar developments made night bombing against Germany effective, and so the Buckingham did not go into operation in daylight against the heavy industries of the Reich.

By the time the Buckingham was in quantity production the need for a day bomber to share the work with the Mosquito had disappeared, and so the design was adapted for use in Transport Command as a high-speed courier, carrying four passengers and a crew of three. Armour and armament were removed and extra passenger seats provided. The range was increased to 3,000 miles by installing two 185-gallon drop tanks in the bomb cell and fitting Centaurus VII or XI engines in place of the combat-rated Centaurus IVs. The two versions were known as the (B) and (C) Mark I's respectively.

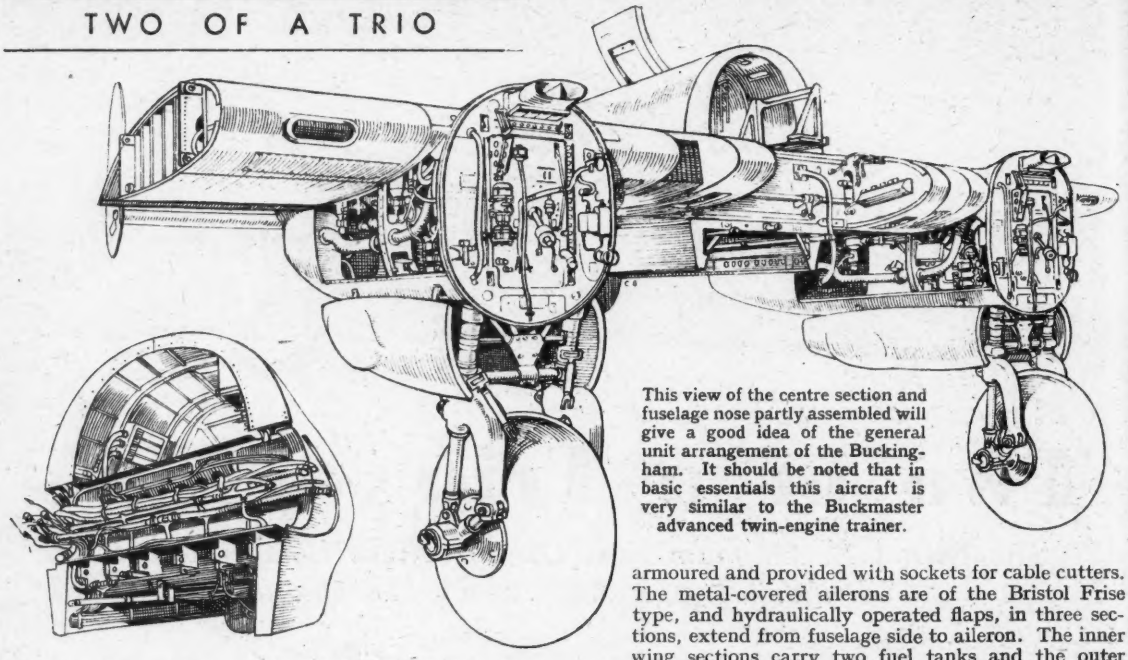
Meeting an Operational Demand

While the Buckingham was being designed, the Beaufighter had been adapted to carrying torpedoes and rocket projectiles and was doing good work as the first of a new class of "strike" aircraft in Coastal Command. Fighter opposition was met in the Norwegian fiords and in the Bay of Biscay, and a demand arose for a faster version of the Beaufighter. The first layout retained Hercules engines (but of an improved mark number), though later it was decided, for production reasons, to modify the design to



The Brigand with bellows-type dive brakes in the open position.

TWO OF A TRIO



This view of the centre section and fuselage nose partly assembled will give a good idea of the general unit arrangement of the Buckingham. It should be noted that in basic essentials this aircraft is very similar to the Buckmaster advanced twin-engine trainer.

take the wings and tail unit of the Buckingham and to use Centaurus in place of the Hercules engines. In this form, with a crew of three, the machine was given the type number 164 and named the Brigand. The type is now in production, and although it has come too late to see action in the Far East, it should prove a worthy successor to the Beaufighter which it replaces as the standard torpedo-fighter-dive bomber of the R.A.F.

Structural Similarity

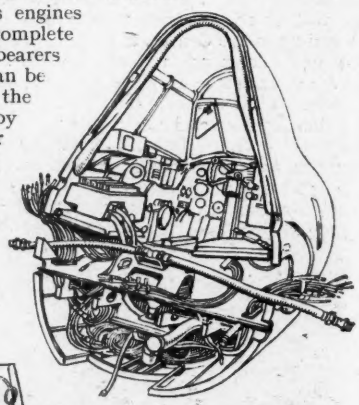
Against the background of history outlined above, the two designs can now be examined in rather more detail. Generally speaking, the two types are structurally similar, with semi-monocoque fuselages and two-spar wings. Minor differences will be dealt with under the respective machines. The fuselage of the Buckingham is divided into three assemblies and is built up from channel-section frames and covered with light-alloy skin panels stiffened by continuous stringers of beaded angle section.

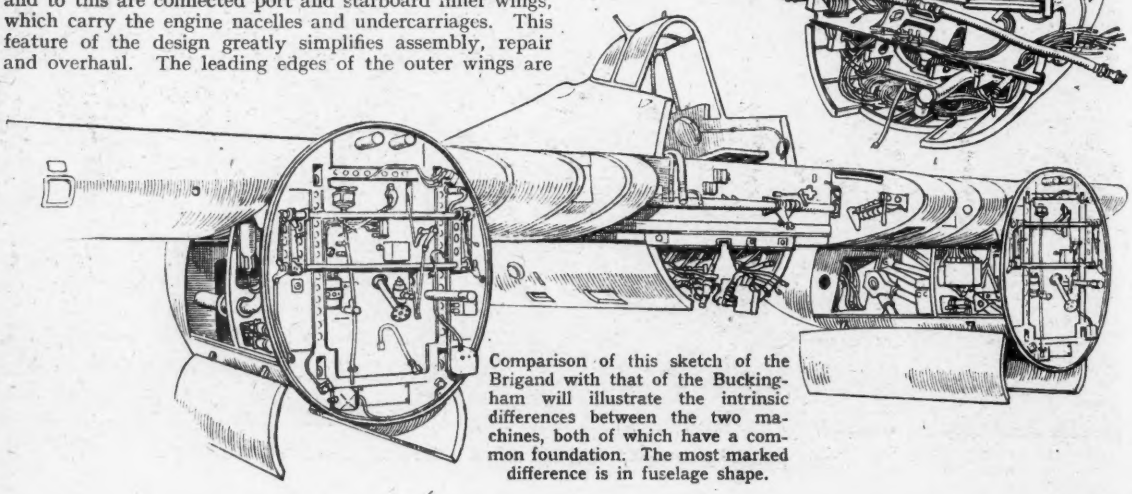
The main aircraft is divided into five main sections. Instead of the continuous centre section of earlier Bristol machines there is a short stub wing built into the fuselage, and to this are connected port and starboard inner wings, which carry the engine nacelles and undercarriages. This feature of the design greatly simplifies assembly, repair and overhaul. The leading edges of the outer wings are armoured and provided with sockets for cable cutters. The metal-covered ailerons are of the Bristol Frise type, and hydraulically operated flaps, in three sections, extend from fuselage side to aileron. The inner wing sections carry two fuel tanks and the outer sections one each. The tanks are of the non-metallic self-sealing Mareng type.

Structurally the tail unit is of the same type of construction as the wings. Elevators and rudders are fabric covered. Flying controls throughout are of the Saunders push-pull rod type, and ailerons, rudders and elevators have controllable tabs with spring servo action.

Each main undercarriage unit comprises two Lockheed Airdraulic struts in a cast light-alloy frame of Lockheed design. The tailwheel unit is of the levered suspension type, of Turner design, and retracts forwards.

The two Centaurus engines are mounted as complete power plants with bearers and cowlings and can be removed from the nacelle structure by disconnecting four attachment points. The air intakes and Vokes dry filters are mounted in the





Comparison of this sketch of the Brigand with that of the Buckingham will illustrate the intrinsic differences between the two machines, both of which have a common foundation. The most marked difference is in fuselage shape.

TWO OF A TRIO

leading edge, outboard of the nacelles.

A 24-volt electrical system is installed, and a full range of two-way radio, beam approach and intercommunication equipment is carried.

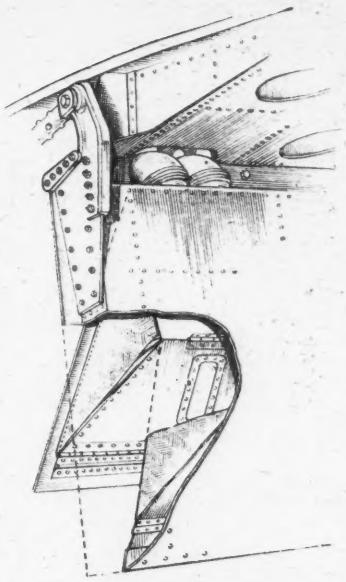
In the bomber version of the Buckingham the pilot's cockpit is ahead of the leading edge and gives him a good forward and upward view. Sideways the view is somewhat restricted by the engines, but not seriously so since they are set below the upper surface of the wings. The windscreen has an optically flat panel which affords accurate sighting of the four fixed rifle-calibre Browning guns.

Dorsal Armament

Between front and rear spars is located the radio operator's swivelling seat. The fixed mast and D.F. loop are mounted above the port side. Aft of the rear spar is the Bristol B.12 Mk. I dorsal turret, which mounts four rifle-calibre Brownings. It is hydraulically operated and has 360 deg. rotation, combined with a range in elevation and depression of 85 deg. The turret has a clear space through it to allow the crew to pass backwards and forwards.

The bomb cell is located below the spars and extends from beneath the pilot to a point beneath the dorsal turret. Provision is made for carrying either one 4,000lb. bomb, two 2,000lb., four 1,000lb. or six 500-lb. bombs.

To give the navigator/bomb aimer the best possible downward view without interfering with that of the pilot, his station has been moved from the orthodox position in the nose to the rear portion of the fuselage. Here he has two large side windows for navigating and also a nacelle, or "bath" as it has been nicknamed, in the floor. At the forward end of the "bath" is a sloping optically flat panel with de-icing spray and an electrically operated wiper. The bomb sight is mounted behind this panel, and at the rear end of the "bath" is a Bristol B.13 hydraulic turret mounting two 0.303in. guns. These cover a field below the tail which cannot be covered by the mid-upper gunner.



Details of the Brigand dive brakes (bellows type), which are kept closed by venturi valves and ducts in the leading edge.

The Brigand

The Brigand is a twin-engined, long-range attack monoplane powered by two Centaurus 57 engines, which give their maximum power at low altitudes. With a crew of three it can carry a 22-in. torpedo, a pair of 1,000lb. bombs, or 16 rocket projectiles, in addition to its armament of four 20mm. cannon. As a long-range escort fighter it carries either a 200 gal. drop tank together with rocket projectiles or an additional pair of 90 gal. drop tanks if the rocket projectiles are not required. With the single drop tank the range is increased to 2,375 miles, and with all three to 2,770 miles, compared with the normal range of 1,980 miles.

The crew of three are accommodated, in the Brigand, in a central cabin. Their close proximity facilitates the close team work needed in firing torpedoes at high speed. The extreme nose houses the latest type of A.S.V. radar scanner, enclosed in a plastic dome which conforms to the fuselage shape. Heavy armour plate protection is provided, and the pilot's windscreen is of optically flat bullet-proof glass 2½in. thick. The navigator and radio-operator sit side-by-side on the port side so as to face the starboard side on which their chart table and radio equipment are mounted. An additional seat behind the pilot is used by the navigator when aiming the torpedo or bombs.

Sloping up and back from the rear spar is a reinforced fuselage frame which carries a mounting for a 0.5in. Browning gun. The four Hispano cannon fire through blast tubes carried below the cabin floor. The cannon can be fired together or in inner and outer pairs by means of a selector on the control column.

The torpedo is carried externally in a standard sling and release unit. The four crutches are spring loaded so that when the torpedo falls away they automatically retract into the fuselage. The two carriers for 1,000lb. bombs are mounted in tandem below the centre line of the fuselage and have similar crutches. A torpedo camera is enclosed in a fairing under the front fuselage, and there is also a cine

(*Concluded at foot of p.* 630)

MAIN DATA FOR THREE BRISTOL TYPES

	Buckingham (B) I	Buckingham (C) I	Brigand
Length o.a.	46ft. 10in.	46ft. 10in.	46ft. 5in.
Wing span	71ft. 10in.	71ft. 10in.	72ft. 4in.
Wing area (gross)	708 sq. ft.	708 sq. ft.	718 sq. ft.
Tailplane span	22ft. 0in.	22ft. 0in.	22ft. 0in.
Tailplane area (incl. elevators)	143 sq. ft.	143 sq. ft.	143 sq. ft.
All-up weight	37,000 lb.	34,000 lb.	38,200 lb.
All-out level speed (m.p.h.) "S" gear	330 at 12,000ft.	336 at 12,000ft.	358 at 13,700ft.
Max. weak-mixture speed (m.p.h.) "M"	285 at 8,500ft.	294 at 8,500ft.	292 at 10,700ft.
Max. weak-mixture speed (m.p.h.) "S"	305 at 18,000ft.	310 at 18,000ft.	311 at 21,300ft.
Initial rate of climb	1,700ft./min.	2,000ft./min.	1,500ft./min.
Service ceiling	25,000ft.	28,000ft.	26,000ft.

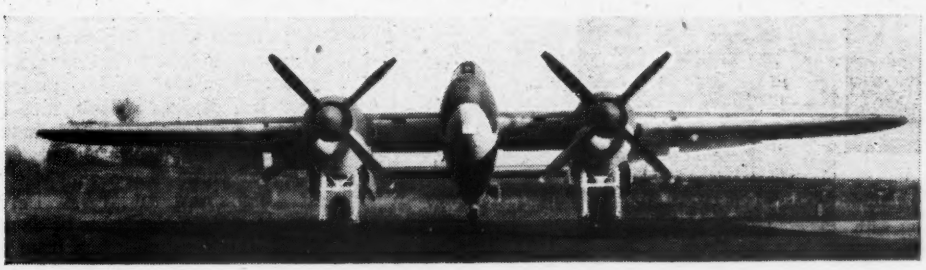
Still-air Ranges and Speeds with Standard Tankage (1,066 gals.)

	Buckingham (B) I		Buckingham (C) I	
	Optimum speed	Maximum speed	Optimum speed	Maximum speed
Sea Level "M" gear	2,150 miles at 150 m.p.h.	1,450 miles at 255 m.p.h.	2,300 miles at 165 m.p.h.	1,530 miles at 265 m.p.h.
10,000 ft. "M" gear	2,200 miles at 195 m.p.h.	1,550 miles at 285 m.p.h.	2,360 miles at 190 m.p.h.	1,620 miles at 295 m.p.h.

The still-air range of the Brigand with normal tankage of 1,060 gallons of fuel is 1,980 miles. With a 200-gal. drop tank this is extended to 2,375 miles, and with 300-gal. drop tanks to 2,770 miles.

72ft. 4in.

16ft. 4in.



Chief external difference between the Buckingham and the Brigand is that the latter—shown in this picture—has a slimmer fuselage and no gun turrets; a 0.5in. Browning is gimbal-mounted in the rear of the "glass-house."

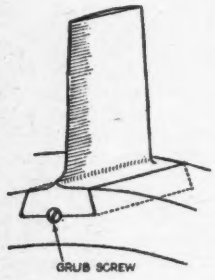
German Jet Developments

Big Production Before the Collapse : Ingenious Designs to Overcome Material Shortages : Insistence on the Axial-flow Arrangement

By SIR ROY FEDDEN, F.R.Ae.S., M.I.A.E.

AMIDST the frantic changes of policy, reckless dispersal of effort, and general misdirection which dogged German efforts in air warfare, the production of jet-propulsion turbine units stands out as one of their solid achievements. By a decision of extreme boldness, they set up a great chain of bomb-proof underground factories for series production of jet units on a vast scale, although they were short of vital raw materials, and unable to achieve a service life longer than 30-50 hours. No other country so desperately short of the vital heat-resisting alloys so essential for turbine efficiency would have dared to gamble to such an extent.

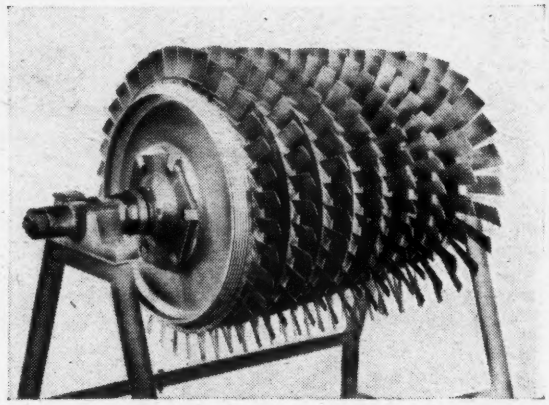
The Germans' jets were less efficient than ours, had a shorter life, used more fuel and had a poorer power-to-weight ratio, but they had small diameter, low drag ratio, and were well suited for installation in multi-engined aircraft. Germany was undoubtedly well ahead of the Allies in production, and hoped, by having large numbers of jet fighters and bombers in action during the autumn of this year, to regain the initiative in the air war. When the collapse came she was well on the way to large series production of the Junkers 004 and B.M.W. 003, and had several other types coming along.



Ju.004 method of fixing compressor blade in drum.

Small Diameter

It is interesting to note that whereas all our initial production jet units have had the centrifugal type of compressor, the German designers all seem to have decided independently on the axial-flow arrangement, despite all the German experience on centrifugal compressors for various purposes. They seem to have been convinced of the paramount necessity of having the smallest possible diameter power plant, and also took the view that, despite its known limitations, peaky performance curves and liability to stall, the axial compressor would ultimately prove to be the most efficient.

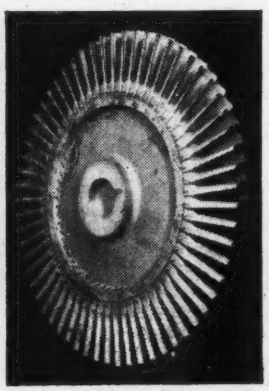


Rotor of the Ju.004 eight-stage, axial flow compressor.

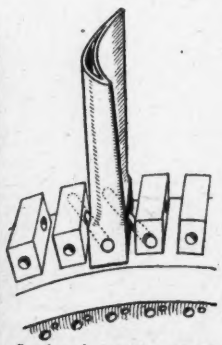
In comparing the performance of British and German jet engines it is obvious how the Germans have suffered from having to conserve vital alloys. They achieved an outstanding advance in bringing to large-scale production the hollow turbine blade with its internal passage for cooling air, but there was an inevitable loss of performance in bleeding air from the compressor to cool the turbine in this way. Their use of a variable-exit jet nozzle may well have given rise to turbulence losses in the jet. In an attempt to restore the situation they appear to have sacrificed combustion efficiency so as to achieve a low pressure drop across the chamber, and this may have aggravated their troubles in connection with unstable combustion at altitude. This probably contributed to the compressor stalling difficulties, which were getting the German jet units rather a bad reputation among the *Luftwaffe* pilots.

The latest Junkers hollow turbine blade.

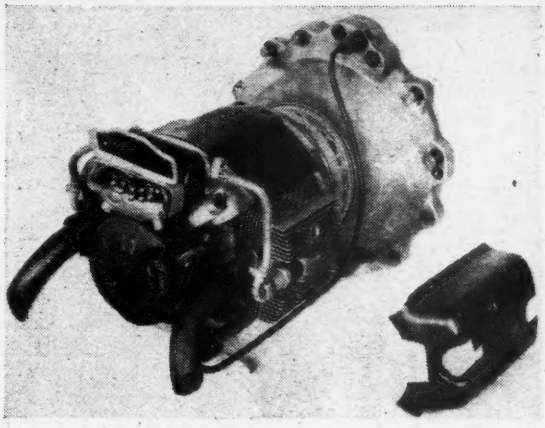
Junkers were the first German company to take an active interest in practical turbine design, under the late Dr. Made. Their first compressor was designed for them by Professor Encke at Göttingen, and the first Jumo 004 engine was built at Magdeburg in 1936. Between 25,000 and 30,000 hours of development-bench running has been done



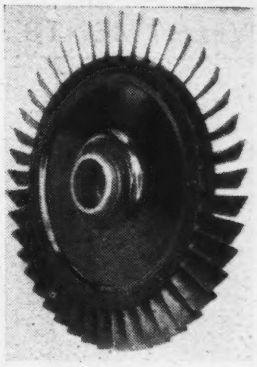
(Above) An alloy blade-drum of the Ju.004 compressor. (Centre) Ju.004 drum with blades assembled.

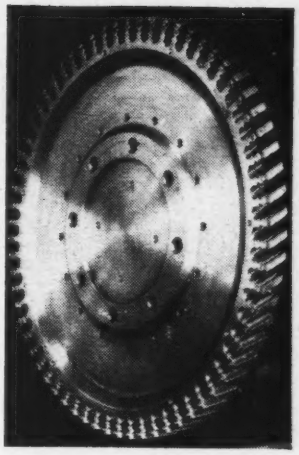


Junkers' most recent method of blade fixing, by special solder and pegging.



Two-stroke flat-twin starter motor fitted in the nose of certain German jet units.

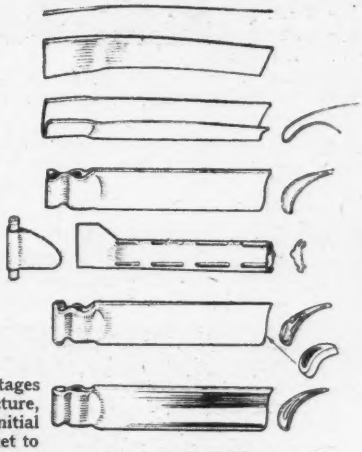




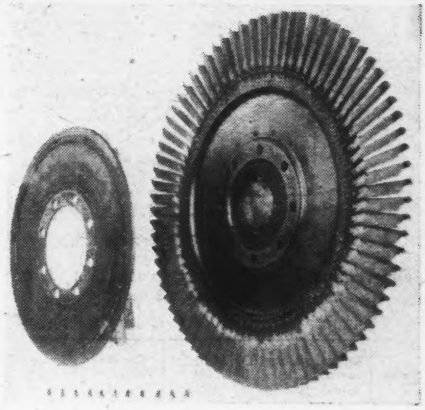
(Above) A stage of the B.M.W. 003 compressor. (Right) The latest modified B.M.W. turbine wheel.

GERMAN JET DEVELOPMENTS

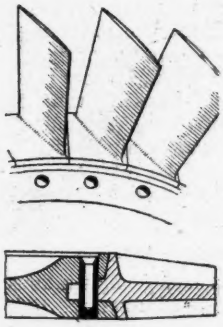
on this type, and over 5,000 units had been produced before the war ended. Production was over 1,500 a month when Germany surrendered, and the ultimate target was 5,000 per month. Over 1,300 aircraft have been fitted with the Jumo 004 engine.



(Right) Stages of manufacture, from the initial tapered sheet to the finished hollow blade of the B.M.W. 003 with its tiny air deflectors.



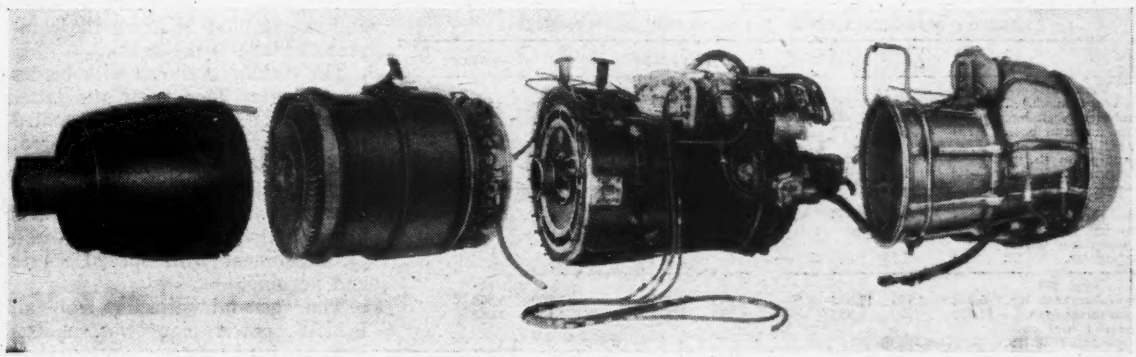
B.M.W. 003 turbine wheel. From a batch for final machining, it awaits boring of the main boss.



B.M.W. method of locking compressor blades.

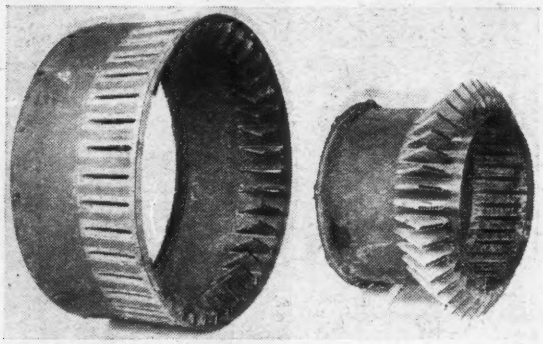
The production series 004 has already been illustrated in *Flight*. It weighs 1,543 lb. and gives 1,984 lb. thrust at 8,700 r.p.m. It consists of an eight-stage, axial-flow compressor, multiple combustion chambers built up from sheet and a single-stage turbine incorporating hollow blades. The jet orifice is controllable.

The compressor casing is of cast magnesium split axially into two halves, and the stator assemblies are bolted into each half. This part of the design is not particularly impressive, but the turbine, with its hollow blades fabricated from taper-rolled austenitic steel sheet, is an interesting example of the German skill in improvising to overcome shortages of alloys. The adiabatic efficiency of the compressor was stated to be

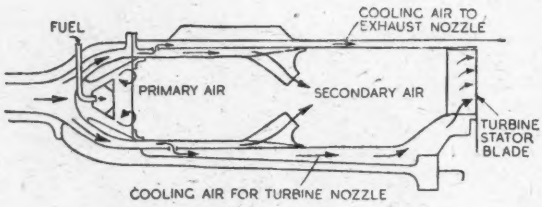


Small diameter was a feature of the B.M.W. 003 unit, here shown "exploded."

GERMAN JET DEVELOPMENTS



The B.M.W. 003 combustion chamber.



Diagrammatic section through the B.M.W. 003 combustion chamber.

The B.M.W. 018 jet unit was destroyed before the Allied advance. Here are the turbine remains.

85 per cent. and that of the turbine 79 per cent., while 7 per cent. of the compressor output was diverted to cool the turbine blades and guide vanes.

After 30 hours' service the whole engine would be stripped for cleaning and overhauling of the compressor and detailed inspection of the turbine wheel and combustion chambers. This work was remarkably simple and was very cheaply carried out by women and slave workers. On about 50 per cent. of the engines overhauled a number of compressor rotor and stator blades needed replacement due to damage from foreign bodies passing through the engine, and turbine blades were frequently found cracked owing to unskilled handling by the pilots. Junkers' technicians claimed that a new engine could be assembled in 50 man-hours, and a complete overhaul required 100 man-hours.

TABLE I: B.M.W. JET UNITS IN PRODUCTION AND DEVELOPMENT

Type	Diam. mm. (ins.)	Length mm. (ft. ins.)	Weight Kg. (lb.)	Thrust Take-off Kg. (lb.)	Compressor Stages	Turbine Stages	R.P.M.	Remarks
003 A0				(lb.)				
003 A1								
003 A2	690 (27.1)	3,150 (10 4)	610 (1,344)	800 (1,768)	7	1	9,500	In series production.
003 E1								
003 E2								
003 C	690 (27.1)	3,000 (9 10)	610 (344)	900 (1,990)	7	1	9,500	Improved design just going into production.
003 D	700 (27.5)	3,150 (10 4)	620 (1,366)	1,250 (2,762)	8	2	—	Design in hand.
003 R	—	—	Normal 003 A2 engine with special non-expendable rocket motor giving 2,700 lb. extra thrust for 3 mins.					
013	1,250 (49.2)	4,200 (13 9)	2,300 (5,083)	3,400 (7,520)	12	3	—	Design complete. Prototype destroyed.
023	1,250 (49.2)	5,800 (19 0)	3,300 (7,300)	8,000 (17,680)	12	4	—	Uses compressor and turbine of 018. Fitted with airscrew. Design not complete.
3305	850 (33.5)	3,200 (10 6)	900 (1,984)	1,700 (3,760)	not known	1	—	Design in hand.
3307	690 (27.1)	2,850 (9 4)	650 (1,433)	500 (1,105)	not known	1	—	Expendable. Projectile of large calibre. Very low cost of manufacture.

TABLE II: FERFORMANCE CHART OF B.M.W. JET ENGINES

	At Sea Level				At 26,000 ft.			At 40,000 ft.		
Type 003A										
Air speed (m.p.h.) ...	0	250	500	560	250	500	560	250	500	560
Equivalent shaft h.p.	—	1,305	2,690	3,140	617	1,480	1,780	366	910	1,065
Total thrust in lb. ...	1,763	1,455	1,500	1,554	694	826	881	407	507	529
Specific fuel consumption lb./lb. thrust/hr. ...	1.4	1.73	1.97	2	1.54	1.72	1.74	1.5	1.65	1.7
Type 018										
Total thrust in lb. ...	7,500	—	6,400	6,612	—	3,760	—	—	—	—
Specific fuel consumption lb./lb. thrust/hr. ...	1.1	1.15	—	—	—	1.4	—	—	—	—
Type 028										
Equivalent shaft h.p.	6,800	8,500	12,600	—	5,650	8,000	—	3,700	5,500	—
Total thrust in lb. ...	17,600	9,500	6,850	—	6,300	4,500	—	4,140	3,080	—
Specific fuel consumption lb./lb. thrust/hr. ...	—	0.95	1.46	—	0.67	1.12	—	0.63	1.06	—

Calorific value of fuel: 18,900 BTU/lb. (10,500 cal./Kg.)

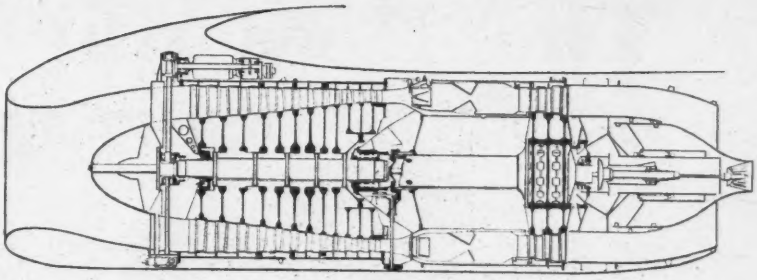
Compressor Details

The accompanying illustrations show the 004 compressor unit assembled, the light alloy drum for carrying the blades (machined on a special seven-spindle automatic indexing machine designed and made at the Junkers Magdeburg factory) and the method of fixing the compressor blade in the drum.

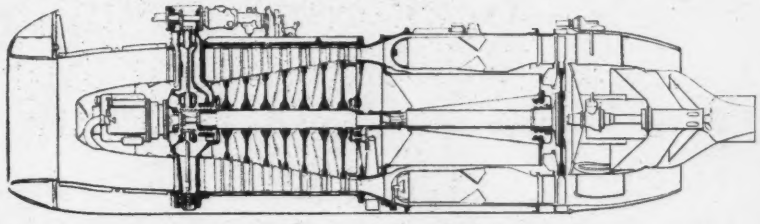
The turbine is shown with blades assembled. This is of the latest construction, and it will be noted that the main boss is not yet bored, having been taken from a batch in course of final machining. Other views show the latest hollow Junkers blade, and the most recent method of attachment with special solder and pegging.

The general direction of all B.M.W. power plant was, as has already been stated, under Herr Bruckman, the jet design being the

GERMAN JET DEVELOPMENTS



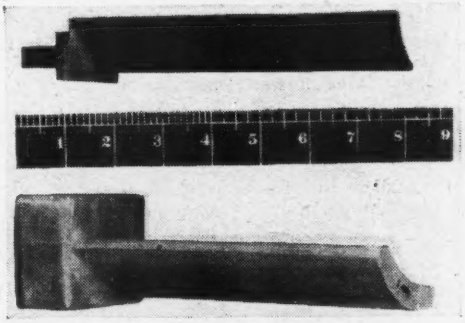
General arrangement of the B.M.W. 018, designed to give 7,700 lb. thrust.



The B.M.W. 3306 project (seven-stage compressor and single-stage turbine), designed for 3,750 lb. thrust.

special province of Dr. Oestrich. B.M.W. did not start work on jet propulsion until 1937, and produced their first jet unit at Spandau in 1939. As a result, they had not the considerable background of experience acquired by Junkers, but the general opinion was that their 003 unit was intrinsically the better job and would ultimately supersede the Jumo on a number of machines. Like Junkers, the B.M.W. team went to Dr. Encke at Göttingen for their original compressor, but broke away from this design, and later relied entirely on Dr. Oestrich for all compressor and turbine technique. Various marks of the 003 have been built, but they are basically the same and differ from the Jumo chiefly in having a single annular combustion chamber containing 16 burners. This feature enabled B.M.W. to achieve an overall diameter 10 cm. smaller than that of the Jumo.

Originally, the compressor had six stages, but seven were used on production, and a new series was on the way with eight stages. Air to cool the hollow stator and turbine blades consumed about 5 per cent. of the compressor capacity. The compressor efficiency was said to be 78 per cent., and that of the turbine 79 per cent. It was claimed that the B.M.W. gave an overall life of 50 hours, after which the turbine wheel needed careful inspection. The turbine rotor could be replaced in two hours without removing the engine from the aircraft. A life of 200 hours was claimed for the combustion chamber.



B.M.W. 018 compressor blade forging and turbine blade.

The engine was being steadily improved, and in the 003C and 003D various minor modifications increased the thrust from 1,763 lb. to 1,984 lb., and finally to 2,780 lb., using eight compressor stages and a two-stage turbine.

A neat air-cooled two-stroke starter was fitted into the nose of the B.M.W. 003 (it was also used in the Junkers 004). Rumour had it that these little engines gave trouble; I should imagine that this was due to insufficient development or bad manufacture, as it is certainly a most attractive little job, light and compact.

Details of the B.M.W. 003 compressor and turbine are shown in the illustrations.

B.M.W. have a fine development and research team, with the latest interferometer equipment and high-speed wind tunnel for the investigation of blade efficiency and other problems relating to jet engines.

Table I is a formidable list of B.M.W. jet engines in production and under development, and Table II shows the performance of these engines. As early as 1940 work was begun on the B.M.W. 018 engine, designed to give 7,700 lb. thrust, but dispersal and our bombing delayed progress. Eventually a compressor was actually made and tested, but was deliberately destroyed as our armies advanced. We saw the burnt remains in a hole outside the Stassfurt Works. The accompanying photograph shows one of our mission measuring with his hand the size of the diffuser. This unit was to be on the same general lines as the 003 but was to have a 12-stage compressor and three-stage turbine running at 6,000 r.p.m.

A project in hand was the B.M.W. 3306, designed to give 3,750 lb. thrust. It would have had a seven-stage compressor with single-stage turbine, and the Germans thought it could be running in the summer of 1946. Another turbine unit which B.M.W. had in the design stage was the 028, which was intended to drive an airscrew. A fourth stage was to be added to the turbine, and 7,000 airscrew horse-power was expected.

Herr Bruckman, the power plant director of B.M.W., was well satisfied with the compressor efficiencies attained by his firm, and considered that more effort should have been expended on combustion-chamber design and the development of automatic controls to prevent abuse by pilots opening up too suddenly. He hinted that he might be interested in liquid-cooling for the turbines and in the development of the constant-volume cycle on the Holzworth principle, despite the extra complication involved.

(Previous articles on German technical developments as revealed after the collapse appeared in "Flight" of September 27th and October 4th (by G. Geoffrey Smith) and November 29th and December 6th (by Sir Roy Fedden). Part II of this article, appearing next week, will conclude the latter writer's series.)

The Post-war Gipsy

New Range of the Famous D.H. Engines from 150 to 330 h.p.

Gipsy Queen 71 engines on the production line.

THE de Havilland Engine Co., Ltd., have announced that they are to produce a range of five entirely new engines which will cover, in convenient steps, a power range of from 150 to 330 h.p. Of the five new units, the two lowest powered are the Gipsy Major series 30 and Major series 50, both of these being four-cylinder engines, whilst the remaining three of the new range are all six-cylinder units and are known respectively as Gipsy Queen series 30, 50 and 70.

All the new engines are of larger bore and stroke than the comparable four- and six-cylinder range engines produced by de Havillands in recent years, and, in addition, they comprise normally aspirated and supercharged, direct-drive and geared versions within their range. Besides being of increased capacity the new Majors and Queens embody a considerable number of refinements in design which have been under development and test for a number of years, although there are no radical departures in design from the basic standard established many years ago by de Havillands and thoroughly proven in almost every country of the world.

Interim Units

In the change-over to peacetime production de Havillands are first concentrating on the six-cylinder Queen 30, 50 and 70 series, and it is expected that these will be available during 1946; the Major 30 and 50 series four-cylinder engines will follow at the earliest possible date that capacity allows. Meanwhile, as an interim measure until the new Major series become available, improved models of two current engines are being made and are immediately available. The first of these is a modernised and lightened version of the Tiger Moth power unit with power output increased to 145 h.p. and known as the Gipsy Major 10. The other interim engine is a refined version of the well-established Gipsy Six II, almost universally known as the Gipsy Queen II, and will serve the 200 h.p. category. The new unblown Major 30 and supercharged Major 50 series which will replace these current engines give 160 and 200 h.p. respectively.

In the higher power categories the new Gipsy Queens are as follows: The unsupercharged direct drive Queen 30 series give 250 h.p. for take-off; the supercharged Queen 50 series give 300 h.p., and the supercharged and geared Queen 70 series give 330 h.p. for take-off, with the likelihood that they will be further developed before long to a higher rating.

Briefly, the normal development programme has necessarily accumulated many possible refinements during the past 8 to 9 years, and such improvements as can be easily incorporated are embodied in the current unblown engines, the Major 10 and Queen II, whilst the more far-reaching developments are being built into the completely new range of engines.

It is worthy of record that development continued throughout the war years, during which no fewer than 10,212 Gipsy engines were built at the de Havilland Engine Company's Stag Lane factory, whilst a further 1,300 were built by General Motors (Holdens) Ltd., in Melbourne, Australia.

A detailed technical description of the new engines, with special illustrations, will appear in *Flight* of December 27th next.

TWO OF A TRIO

(*Concluded from page 625*)

camera which is operated by the gun-firing button.

In the lower surface of the outer wings there are sockets for bomb carriers and for rocket projectile units. These may be either of the rail or of the "zero length" type.

Structural differences between the Buckingham and the Brigand are few. The Frise ailerons are slightly larger than those of the Buckingham, and the outer wing tips are of resin-bonded plywood construction so as to form a non-metallic housing for the radar transmitting antennæ.

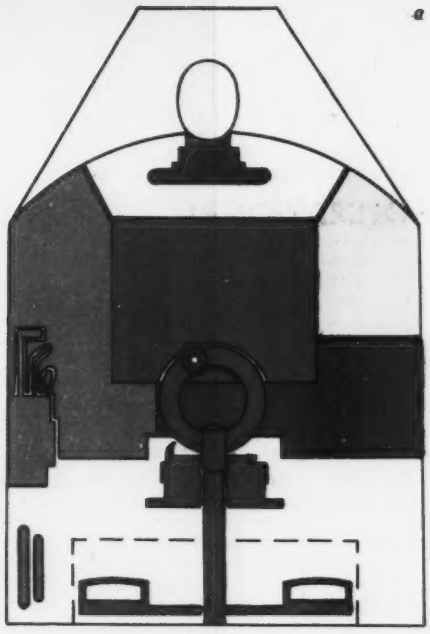
On the Brigand there are dive brakes of the bellows type above the trailing edge and on the under side of the split flaps. They are maintained closed by venturi valves and ducts in the leading-edge which cause a reduction in pressure within the bellows. To operate the dive brakes the valves are closed by hydraulic jacks, and the ram pressure which then builds-up in the ducts forces the bellows open.

The Centaurus 57 engines are installed as complete power plants. They have R.A.E.-Hobson fuel injectors, the air intakes for which are in the form of scoops on each side of the nacelle. There is a methanol/water injection system on these power plants, for which a 30-gallon tank is provided in each inner wing. The engines drive Rotol four-bladed fully feathering airscrews of 14ft. diameter, with spinners and fans to assist ground cooling.

Cockpit Classification

Four Main Groups : More Logical Cockpit Drill : Colour and Position Grouping of Instruments and Controls

By Flt. Lt. Gordon White, A.R.Ae.S.



The group layout scheme shown in "conventionalised" form :— "Flying" items coloured blue; "control" items red; "engine" items yellow; "auxiliaries" green; and "operational" items purple.

THE art of flying becomes increasingly complex, and nowhere is this more obvicus than in the pilot's cockpit. Here the instruments and controls have multiplied to such an extent that the solving of the technical problems has increased the more difficult problem, that of their human supervisor. The pilot now has more to do, and, generally, less time in which to do it. Technical improvements have certainly overcome many of the problems of flight, but they have also created their own problems for the pilot. Human capabilities do not always match technical developments.

The new problem is this : Lack of a uniform and rational system of cockpit layout in modern aircraft has added an unnecessary complication to flying in general, and, in particular, to training and cockpit drill. In extreme cases, this lack has led to avoidable and sometimes fatal accidents.

Few pilots will be found who do not agree that some system of cockpit uniformity is badly needed. That the problem is real enough is also shown by the numerous articles which have been published in recent years dealing with this subject, and by the general opinion of many pilots.

This article forms a constructive attempt to solve the problem, and to establish a uniform system of cockpit layout for all types of aircraft, both civil and military. The task is approached by formulating a basic "theory" of cockpit controls and instruments, by applying this conception to theoretical and to practical flying, and by the manufacture of aircraft in conformity with this theory.

BROAD APPROACH

Suggestions to better the present system have usually offered two solutions—(*a*) Standardisation, and (b) Attention to individual items with regard to shape and colour. Standardisation is a rigid formula which cannot be practical in view of the greatly varying types of aircraft in commission. It was once tried experimentally at Farnborough, but was soon given up. The problem cannot be solved by attending first to details—a broader approach is needed. We must see the wood, and then look at the trees.

It may be asked—but is not cockpit drill, so far as instruments and controls are concerned, the master code of flying? It is essential and effective, but is made more difficult by the very lack of a rational layout. As I hope to show, drill is but a part of classification. Classification is the broad basis—a specification which could be laid down for all manufacturers to follow.

Simply, it means the classification of *all* cockpit controls and instruments into definite groups according to their purpose, the practical layout of these groups in the cockpit, and the flying training required according to this grouping, which incorporates the standard cockpit drill.

It is an attempt to crystallise various tendencies which are apparent in modern design, but which have yet not been developed to a logical conclusion. In fact, the whole idea was suggested by studying these unconscious tendencies. Classification is essentially this :—

A. All instruments and controls are to be classified into four main and two subsidiary groups.
B. These groups shall be progressively learned, with periodic examinations as part of flying training, so that a pilot knows instantly into which group any instrument or control is classified.
C. The four main groups are each to have an area in the cockpit and the location of these areas will be, as far as design permits, invariable for any type of aircraft.
D. Each area is to be bounded by an appropriate coloured border, so that a group may immediately be recognised by its colour.

Here are the Groups printed on their colours :—

MAIN : FLYING CONTROL ENGINE

SUBSIDIARY : RADIO

It might appear that some instruments and controls would overlap the four main groups. But it is absolutely essential that everything to be found in any cockpit is classified and learned in a definite group, even if in purpose it would appear to overlap. First, the difference between FLYING and CONTROL.

FLYING includes those instruments and controls which are in constant use when the aircraft is airborne. Such are the control column, rudder bar, instruments of the flying panel, compass and clock.

CONTROL includes those instruments and controls not in constant use when flying and which may be considered as only being used for occasional adjustment. These are, briefly : throttles, mixture control, airscrew controls, flap and undercarriage controls and indicators, trimming controls and so on.

ENGINE. This section consists mostly of instruments for, as we see above, nearly all engine controls come under "control." It covers, generally, boost, temperatures, pressures, fuel gauges, and any engine controls not covered by CONTROL (i.e., controls which are not a part of Cockpit Drill).

AUXILIARY. This is just what it suggests—the odds and ends not included in the above three groups;

COCKPIT CLASSIFICATION

such items as inter-communication, oxygen regulator, brake pressure indicator, and light switches.

[redacted]. This group embraces those controls and instruments which only serve the military purposes of the aircraft. These are extra to the aeronautical needs of the machine. It would, of course, be a service and sometimes a secret group, but as an indication of what I mean, it includes bomb switches, flare switches and recognition lights. In a multi-seater aircraft, most of this group may be outside the control of the pilot.

RADIO. Normally, the pilot will only deal with this in a single-seat machine, but, for this reason, it must be classified in a definite group.

Two small items tend to be troublesome. Strictly, within the classification, the brake lever is CONTROL and the gun button is OPERATIONAL. Both of these are usually found on the control column, which is FLYING. However, no harm is done if such exceptions are recognised. They should still bear their group colour.

One small point must also be mentioned with regard to colours. A few instruments have recognised colours. For example, a boost gauge is painted red and an oil pressure gauge yellow. But, nevertheless, these two instruments will remain in the yellow group—ENGINE. The colour attached to each group is no mere artistic after-thought; with the classifying of all items it is the most important part of the theory. For instance, the flying panel is surrounded by a blue border about ¼-½ inch wide, the engine panel by a yellow border, and so on. Thus, no matter what the type of aircraft, a pilot may instantly, and almost unconsciously, identify the group areas in the cockpit. Let us suppose he needs the flap angle indicator in a new aircraft. His previous study of classification gives him the definite knowledge that this is in the CONTROL group, and is found almost instantaneously. This one example should show the value of classifying an instrument into a definite group, and identifying that group by its colour. And it applies continuously, even if the aircraft is familiar to the pilot. (Emergency levers and equipment would still be painted red overall—classification only requires a red *border* for "CONTROL.")

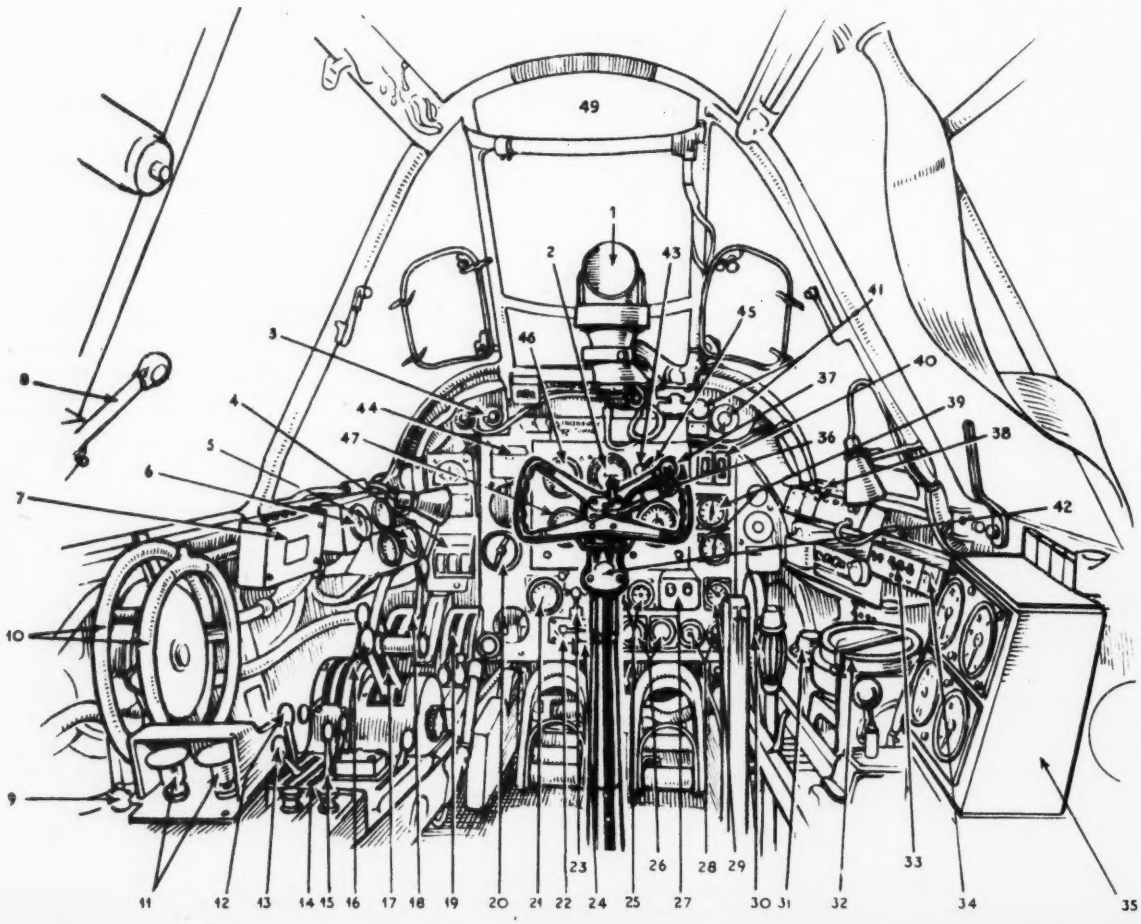
DETAIL CLASSIFICATION

The list below is by no means complete, but is the basis of classification, including that for the more usual controls and instruments. Some may even disagree on the grouping of an item. But the idea remains generally valid :—

[redacted]

Control column.
Rudder bar.
P. type repeater compass.
Blind approach visual indicator.
Automatic pilot controls.
Deviation card and holder.

Flying panel—
Altimeter.
A.S.I.
Artificial horizon.
Directional gyro.
Rate of climb indicator.
Turn and bank indicator.
Clock.



On the left is
in the drawi
classification
into which th

1 Reflecto- Gun S
2 Artificial Horizo
3 Reflector Sight
4 Undercarriage P
5 Fuel Tank Gaug
6 Oxygen Regulat
7 " Press Button
8 Cockpit Heating
9 Fuel Suction Bal
10 Fuel Tank Cock
11 Carburettor Cu
12 Air Intake Cont
13 Blower Control-
14 Cowl Gills Cont
15 Blower Control-
16 Airscrew Speed
17 Throttle Contro
18 Hydraulic Powe
19 Undercarriage a
20 Torpedo Sight C
21 Brake Pressure
22 Undercarriage I
23 Main Magneto S
24 Fuel Jettison Le
25 Oil Temperatur

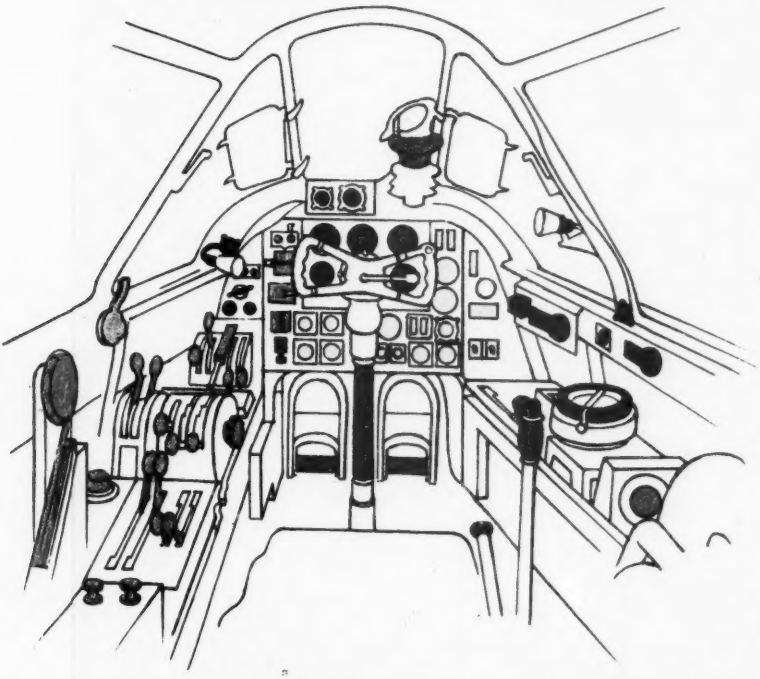
(F) Flyi

CONTROL

Throttles, Mixture control, Airscrew control } One unit.
Feathering controls.
Trimming wheels and indicators.
Magneto switches.
Engine starter switches.
Engine cut-out.
Hydraulic selector
Petrol cocks/switches.
Cowling gill control.
Fuel jettison control.
Radiator controls (oil and glycol).
Wheel-brake lever.
Supercharger gear lever.
Airscrew de-icing control.
Flap control and indicator.
Undercarriage control and indicator.

ENGINE

R.P.M. indicators.
Boost gauge.
Oil temperature gauge.
Oil pressure gauge
Fuel contents gauges.
Engine temperature gauge.
Coolant temperature gauge.
Engine priming pump.



On the left is a typical twin layout—that of the Beaufighter—in its normal form, while in the drawing above the items have been shifted as far as possible to suit the colour-classification system. A key to the various controls and instruments, with the groups into which they would fall, is given below.

1 Reflector Gun Sight (O)
2 Artificial Horizon (F)
3 Reflector Sight Dimmer Switch (O)
4 Undercarriage Position Indicators (C)
5 Fuel Tank Gauges—Port (E)
6 Oxygen Regulator (A)
7 "Press Button" Radio Tuning (R)
8 Cockpit Heating Control (A)
9 Fuel Suction Balance Cock Lever (C)
10 Fuel Tank Cocks Hand Wheels (C)
11 Carburettor Cut-out Controls (E)
12 Air Intake Controls (C)
13 Blower Control—Port (C)
14 Cowl Gills Controls and Indicator Lamps (C)
15 Blower Control—Starboard (C)
16 Airscrew Speed Controls (C)
17 Throttle Controls (C)
18 Hydraulic Power and Emergency Levers (C)
19 Undercarriage and Flap Control Levers (C)
20 Torpedo Sight Control (O)
21 Brake Pressure Gauge (A)
22 Undercarriage Indicator Switch (C)
23 Main Magneto Switches (C)
24 Fuel Jettison Levers (C)
25 Oil Temperature Gauges (E)
26 Cylinder Temperature Gauges (E)
27 Fuel Warning Lights (E)
28 Boost Pressure Gauges (E)
29 Air Temperature Gauge (A)
30 Elevator Trim Control (C)
31 Rudder Trim Control (C)
32 Compass (F)
33 Nav. Lamps and Pressure Head Heater Switches (A)
34 Camera Switches (O)
35 Long-Range Fuel Tank Gauges (E)
36 Wheel Brake Lever (C)
37 Gun Firing and Camera Gun Buttons (O)
38 Torpedo and Bomb Selector Switches (O)
39 Engine Speed Indicators (E)
40 Oil Pressure Gauges (E)
41 Torpedo Sight Dimmer Switch (O)
42 Control Column (F)
43 Wing Camera Gun Button (O)
44 Fire Extinguisher Buttons (A)
45 Rate of Climb Indicator (F)
46 Air Speed Indicator (F)
47 Altimeter (F)
48 Turn and Bank Indicator (F)
49 Torpedo Reflector Sight (O)

(F) Flying. (C) Control. (E) Engine. (A) Auxiliary. (O) Operational. (R) Radio.

[illegible]

Carburettor heating control.
Light switches—
Navigation.
Cabin.
Instrument.
Landing.
Air temperature gauge.
General de-icing controls.
Venturi pump switches.
Intercommunication switch.
Pneumatic pressure gauge.
Pressure head heating switch.
Landing light dipping control.
Accumulator charging control.
Oxygen regulator and flow meter.
Fire extinguisher switch.
Hydraulic hand pump.
Fuse boxes.

[illegible]

Bomb switches.
Bomb door control.
Gun-heating switches.
Flare switches.
Fire control button.
Bomb-aimer's indicator.
Gun sights.
Reflector sight dimmer switch.
Camera button.

RADIO

W/T transmitter/receiver.
D/F loop.
Radiolocation devices.
W/T remote control.

COCKPIT DRILL

I have already suggested that drill is a part of classification, and, as in the matter of present-day tendencies of design, classification embraces the modern technique of drill and makes it an easier and a more logical part of a wider system.

The drill of vital actions is usually learned by means of a string of letters representing the actions themselves in their proper order. These vary, of course, with the type of aircraft, but one at random will serve. This is "TMPFF," meaning Trim—Mixture—Pitch—Flap—Fuel.

It is now seen that all the items covered by TMPFF are red, since they are in the CONTROL group. So are *all* cockpit drills. An easy and a fundamental fact to remember—that the controls and instruments used in the drill of vital actions are all in the CONTROL group enclosed in the red border.

Classification has an even wider application in the routine check of the cockpit. As in the case of drill, let us reduce classification to a string of letters. Thus, FLYING—CONTROL—ENGINE—AUXILIARY—OPERATIONAL—RADIO becomes—F.C.E.A.O.R., which is remembered as "FOR COMPLETE EXCELLENCE ALWAYS OBEY REGULATIONS." A somewhat pious alliteration, but an easily remembered sentence and sometimes a psychological reminder. Now apply this to the routine of flying.

Check Before Take-off

"For"—the pilot (or ground staff) looks over and checks the Flying group—within the blue border.

"Complete"—here the usual checks of the engine will take place, for this is a red operation. Throttle, mixture, airscrew, magneto switches—the controls are red, although the results will be observed in the ENGINE group. So "Complete Excellence" are observed together, but still in the correct order.

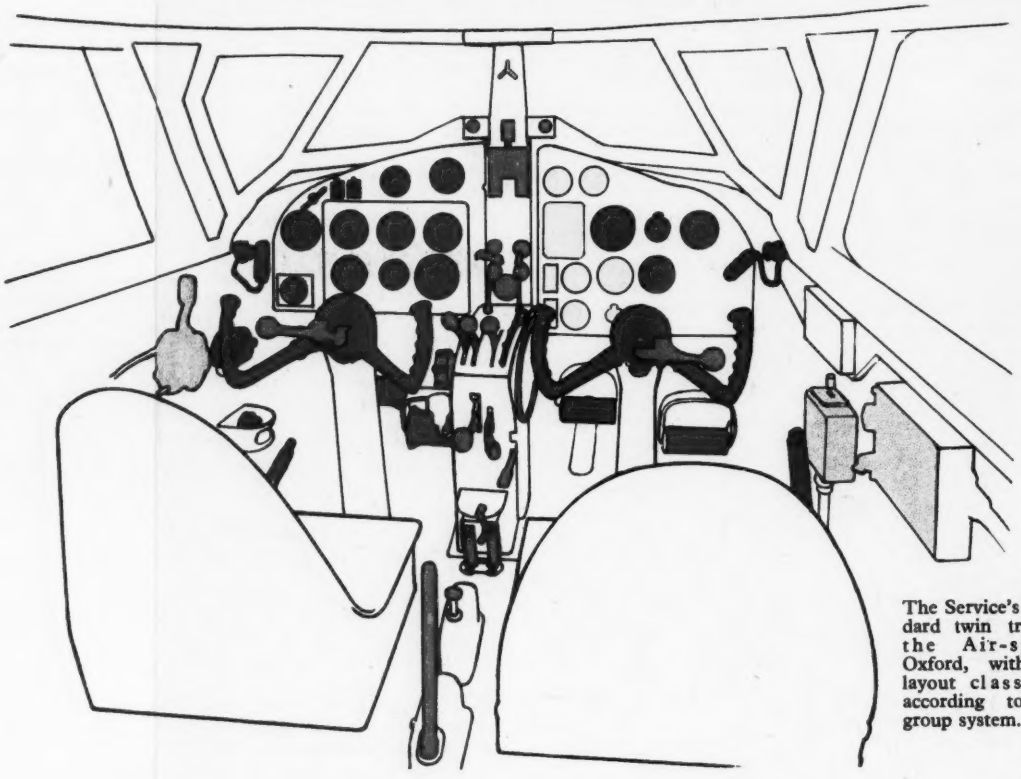
"Always" is normally just a routine check that all is well in this group, "Obey" and "Regulations" are now checked in this order, and the cockpit has been covered in a logical order. Remember this excellent motto, and F.C.E.A.O.R. follows.

Take-off

The Drill for take-off is entirely a matter of CONTROL. Except for the obvious attention paid to FLYING in take-off, all the adjustments necessary in the drill of vital actions are made in CONTROL.

Drill will be an easier and more infallible code if the pilot has only to remember TMPFF, or whatever it may be, and that it is invariably a red matter. For take-off, then, we need, except for the constantly recurring FLYING, only

COCKPIT CLASSIFICATION



The Service's standard twin trainer, the Air-speed Oxford, with the layout classified according to the group system.

pay attention to the CONTROL part of the cockpit. This bears out the original definition that FLYING includes those items which are in *constant* use, whereas CONTROL is a matter of occasional adjustment.

Routine Checks in Flight

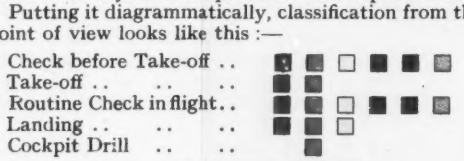
The pilot must, in the absence of automatic warning, be always glancing at his instruments to reassure himself that all is well. With classification, he would do this in the logical sequence of FCEA. Each group is covered in turn as necessary and O and R, being subsidiary groups, can usually be forgotten until required.

A pilot must make a mental check, conscious or otherwise, many times in a flight. It is much easier, and less mentally fatiguing, if it is an automatic check in order of importance, and it would be just that bit more reassuring—with a further saving of nervous energy.

Landing

Obviously, this is exactly the same as for take-off, though the drill of vital actions may be different. FLYING and CONTROL and just the requisite attention paid to ENGINE.

Putting it diagrammatically, classification from the flying point of view looks like this :—



COCKPIT LAYOUT

The keystone to this system is the cockpit layout. Unlike most aeronautical improvements, the suggestions ease rather than complicates the situation.

It depends on the fact that a certain amount of cockpit space is available, and that no more space need be taken up with exactly the same instruments and controls re-sited as required.

TRAINING

This is split into progressive steps, and is shown here purely from an R.A.F. point of view.

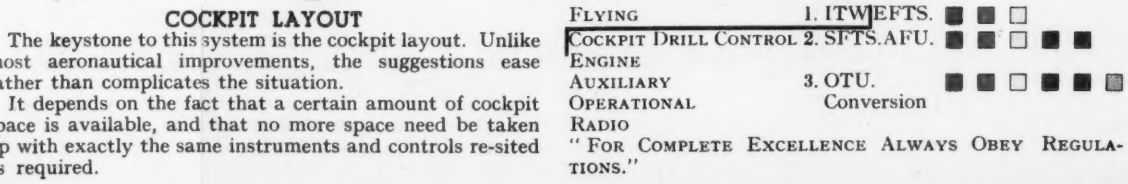
STAGE	SCHOOL	GROUPS	REPRESENTATIVE AIRCRAFT	
1	ITW, EFTS	FCE	—	Tiger Moth
2	SFTS, AFU	FCEA(O)	Master	Oxford
3	OTU Conversion	FCEA(O)R	Spitfire	Beaufighter

It is to be emphasised, however, that this entire plan is equally applicable to civil aircraft, with the exception of O.

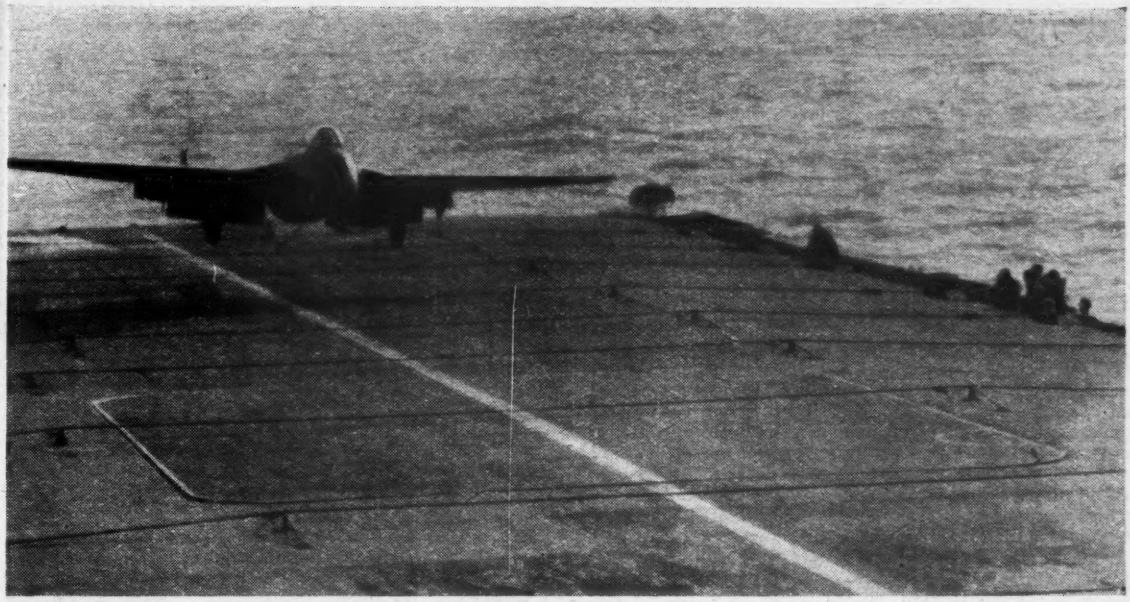
At the I.T.W. stage the general theory would be learned, with the handling of the basic F, C, and E groups. A written examination is taken at each stage, with a detail examination for each new type of aircraft. Cockpit drill would be dealt with as before.

Classification is summed up in the following diagram :—

COCKPIT CLASSIFICATION



"FOR COMPLETE EXCELLENCE ALWAYS OBEY REGULATIONS."



Landing-on as seen from the Island. The Vampire is about to pick up the third wire.

Deck-landing the Sea Vampire

Trials of First Jet and First Tricycle Aircraft for the Royal Navy : Fifteen Landings Completed

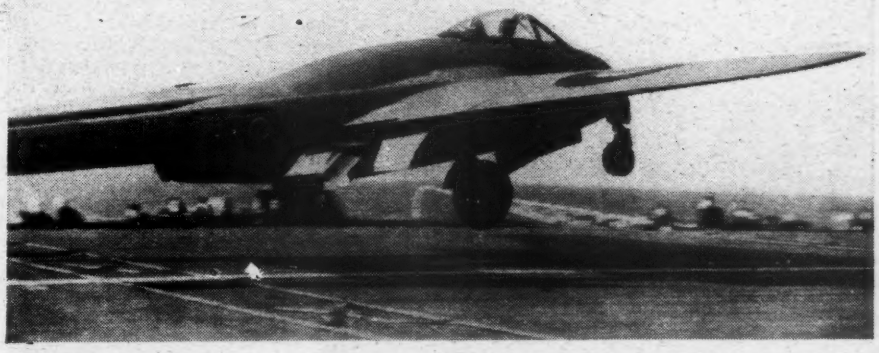
Illustrated by "Flight" Photographs

TO give a short verbal impression of the Sea Vampire being deck-landed it would only be necessary to stress how easy and simple and perfectly normal it all appeared. Actually, of course, the apparent ease of handling was a combination of superb piloting of an excellent aircraft in conjunction with a good crew in a well-found ship.

Last week's trials consisted of fifteen take-offs and landings and the vessel chosen for the task was H.M.S. *Ocean* (Captain Caspar John, R.N.), which is the latest of the 14,000-ton Light Fleet Carriers (*Colossus* class) to be commissioned. Favoured by good weather, the whole series were carried out in two days—which must, in itself, constitute something of a record. The Sea Vampire was piloted by Lt. Cdr. E. M. Brown, R.N.V.R., and the trials were conducted by Cdr. D. C. V. Pelly, R.N., of M.A.P. In view of the circumstances peculiar to deck-landing the Vampire was modified somewhat

Because of the slow acceleration of jet engines at low speeds it was decided to increase flap areas in order that

Lt. Cdr. E. M. Brown walks to the aircraft to start the trials



TAKE-OFF ATTITUDE : The Vampire is well clear of the deck before reaching the first crash barrier.

DECK-LANDING THE SEA VAMPIRE

the greater drag could be offset by larger throttle openings. If a misjudgment of speed or distance then necessitated a burst of speed at the last moment it could be gained by the pilot immediately closing the dive brakes, which are also used to provide extra drag for landing. When the flaps with increased area were at their maximum angle there was only 2½in. clearance between them and the arrester wires. It is not surprising that during the first four landings, which were carried out on the first day, one of the wires hit the flaps and did some trivial damage.

Flaps Remodified

The chord of the flaps was therefore trimmed, giving some four square feet less area. These give a better clearance and, after two or three landings ashore as a check, the remainder of the trials were carried out with these trimmed flaps. The effect in performance was to put the final safe approach speed up from 95 m.p.h. to 100 m.p.h. and, also, it was necessary to use 40 degrees for take-off instead of the previous 30 degrees. With this combination of high engine speed and drag it is interesting to note that the flaps may be used up to 150 m.p.h.

Other figures to be borne in mind are the all-up weight of the Vampire—8,000 lb. as compared with the usual 13,000 lb. of the modern single-engined fighter—and the normal wing loading of 32 lb./sq. ft. This last is very low for a present-day military aircraft. For the first day's trials a wind speed of 30 knots over the deck was maintained, but on the second day this was stepped up by 5 knots. With these figures in mind as a background imagine the flight deck in crystal sunshine on a frosty morning in December and the set-up is complete. The Sea Vampire stands at the after end of the ship while D.H. mechanics give everything a careful inspection. Flight-deck handling parties stand round, full of interest in their new baby. The port watch wear red windproof helmets and the starboard watch green. Aircraft directors and the deck-landing control officer make gay splashes of colour with their yellow helmets and waistcoats, while the deck engineers, who manipulate the arrester gear, crash barriers, and accelerators, wear a more sober white.

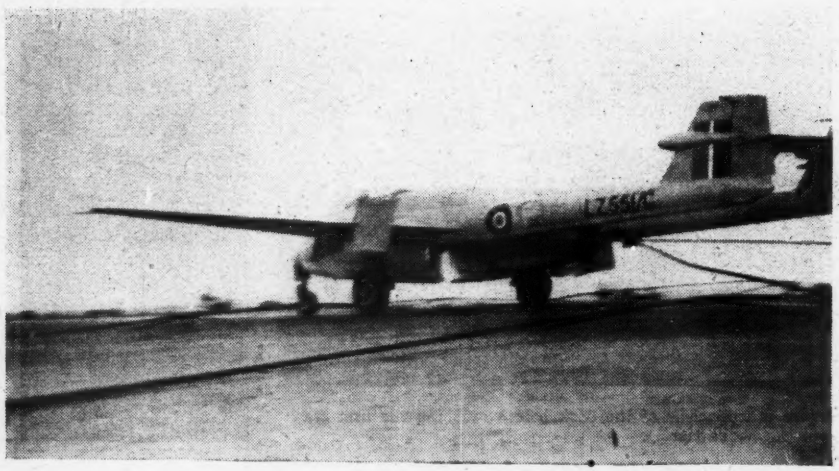
WARMING UP : Red and green helmeted deck handling parties warm chilly fingers in the efflux.

Presently a battery truck is wheeled up to the Vampire and the cable attached. As the starter operates, a small cloud of bluish-white vapour issues from the jet orifice and, almost immediately, the turbine fires. The vapour changes to a heat haze which makes everything seen through it—including our attendant destroyer, H.M.S. *Meynell*—appear to dance.

REFUELLING : This was done from special drums because there was no kerosene store in the carrier.

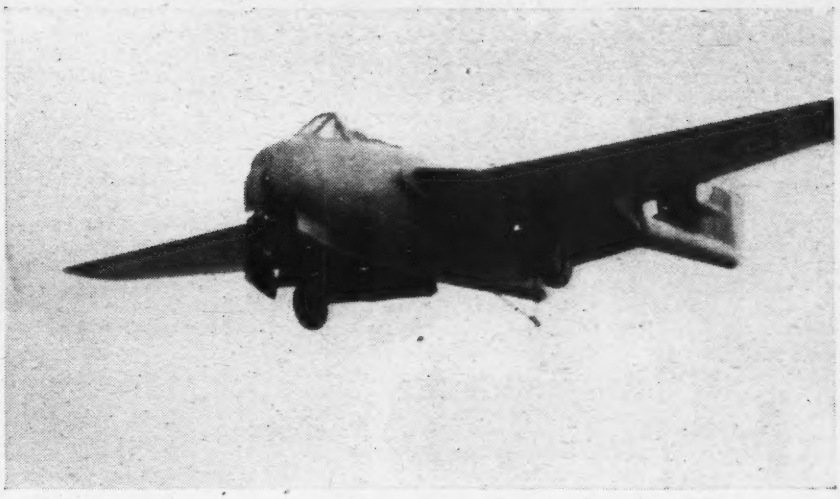
Very little warming-up is necessary for the Goblin, and soon the gentle hum gives place first to a drumming and then to a high-pitched scream which hurts the ear drums. Unlike an orthodox aircraft running-up, there is no slipstream battering the tail, and even at full turbine revs the tail is quite steady. The heat and blast do, however, blow all the grease from arrester wires for 30 yards behind and the thin steel deck buckles slightly where the heat is most intense. Our American friends who employ wooden decks on their carriers will have to do something about it before they use jets on board.

Inside the sealed cockpit Lt. Cdr. Brown seems oblivious of the racket going on outside. He says that inside the aircraft all one hears is a high-frequency whine.



HOOKED : The Vampire at the moment of being pulled up by the arrester wire.

CAPT. CASPAR JOHN, R.N.: The only Naval Air Arm pilot to command an aircraft carrier. He will be remembered as a King's Cup competitor in 1930 and 1931.



EEL'S-EYE VIEW: Vampire coming in over the after round-down. Flaps and dive brakes are at the maximum down position.

The ship, which has been circling to avoid running too far on one straight course, now heads into wind and a chilly gale blows over the deck. Handling parties put their cold hands into the warm air of the jet. Presently the deck is cleared and two officers running across are told by a strident voice from the "Island" to take their caps off. This rule is normally necessary in case hats get blown into the running airscrews. With jets this does not matter except, of course, that the blast would help them overboard.

UNORTHODOX: The engine cowlings of the Sea Vampire are amidships.

An O.K. horn from the "Island" and the control officer waves chocks away. The pilot opens the Goblin up to full revs against the brakes. As the brakes are released the front wheel flicks central immediately and then leaves the deck as the Vampire assumes a nose-up attitude. In less than half the length of the deck—in 280ft., to be precise—the machine is airborne and the undercarriage snaps up before the bows of the ship are reached.

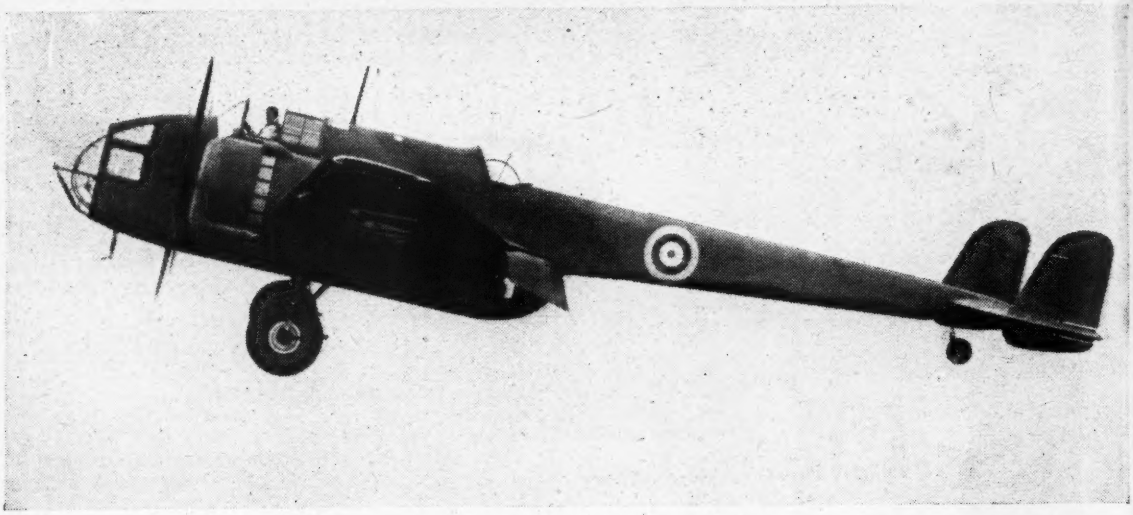
A short circuit round the *Pretoria Castle*, the Navy's training carrier, which is having a full view of the trials, and the approach is made over the aft round-down. With such enormous flaps the Vampire has lost all its delicate beauty. It looks rather like the bat after which it is named. Although the forward landing speed is not very high by comparison with its top speed of 540 m.p.h.—or even by comparison with the airscrew-driven fighters—the vertical rate of descent is high. Such was the exact judgment of Lt. Cdr. Brown, however, that he caught the first transverse wire in his hook and ran for only about 100ft. of the 140 allowed by this wire.

Landing Advantages

It is in the landing that the tricycle-cum-jet arrangement shows itself to the maximum advantage for carrier flying. The pilot is in the nose and has a completely unobstructed view of the deck and the "batsman." The undercarriage—because of the absence of an airscrew—can be short and very sturdy and, the wing being at a negative angle of incidence, there is no tendency to bounce or balloon over the arrester wires into the crash barriers.

The unconventional layout of the Vampire presented some problems when an arrester hook had to be fitted. In order that the pull should be approximately through the centre of gravity it was hinged to the end ribs of the main planes. This means that during most of the arresting period the hook and wire are in the middle of the jet blast. (As already explained, the jet is only partially throttled when landing.) Whether in time this will affect either wire or hook has yet to be seen.

To return to the flying. All through the day, with the exception of breaks for lunch and refuelling, the take-offs and landings went on with monotonous regularity. Such confidence was there that at one time the Vampire was ranged behind a Fairey Barracuda and a Hellcat and flagged-off in its turn. Never did the pilot come further forward than the fifth arrester wire and never did he run beyond the Island before being airborne. For the Navy's first jet and first tricycle trial it was a wonderful show.



In the majority of conditions the Hampden was a forgiving aircraft from the pilot's point of view—whether in its original slotted form, or, later, when the slots had been locked and "built-in."

IN THE AIR—VI

Hampden and Hereford

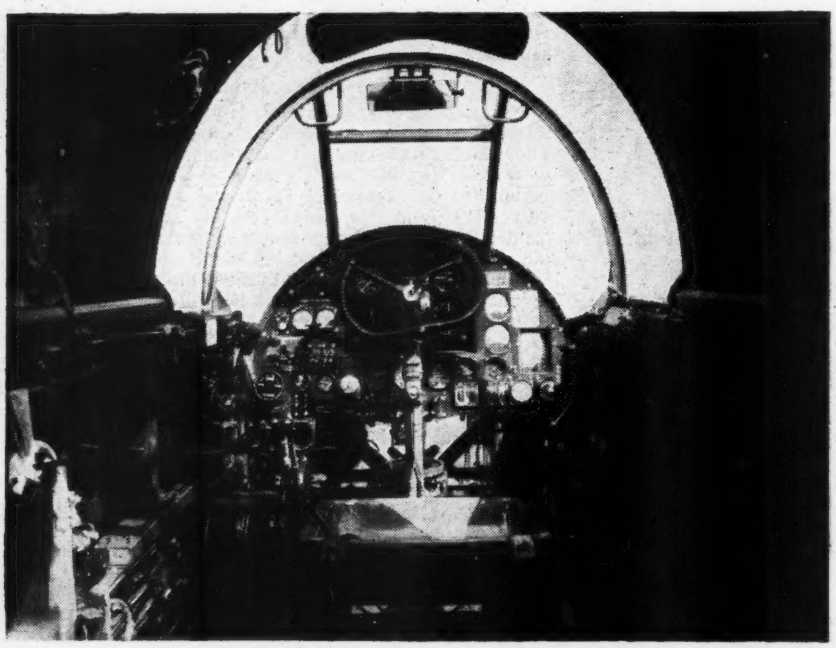
Two Early British "Heavies" in the Series of Handling Impressions

By "INDICATOR"

WHATEVER its operational shortcomings, by modern standards, the Hampden was one of the nicer aircraft in the air. Perhaps I am biased, because it was, in fact, the first of what were then known as "heavy bombers" to reach my inexperienced hands, and because, even in those remote, timid days, it caused me no particular trouble.

Not that my handling efforts in the Hampden were above reproach, merely that the performance was never actively dangerous. I remember weaving somewhat during the first take-off from Radlett as I over-corrected the swing, and I remember, too, the smooth but nevertheless quite unintentional "wheeler" which formed my landing. I hadn't then learnt the trick of three-pointing the outfit and the way in which the hold-off check had to be started early and very firmly indeed if one was to do anything but a series of gentle "kangaroos" along the field.

A little later, after flying a Hereford — the Dagger-engined version of the Hampden—the type became almost faultless in my eyes when I had brought one in much too slowly and stalled it on to the ground from about fifty feet outside the airfield boundary. The A.S.I. was reading something like 30 m.p.h. high, and I was too inexperienced with such a size and shape of aircraft to appreciate the error until it was much too late. The Hereford sank gently and on a perfectly level keel, bounced quietly over a newly made slit trench, and ran a distance which seemed to me no more than ten yards.



The cockpit of the Hampden was neither particularly tidy nor convenient to the newcomer, but the pilot soon learnt to like it, and it certainly gave an excellent field of view.

There wasn't much room in the Hampden's one-place driving compartment, and it must have been no fun at all for those who had to stay in the air for many operational hours. Nor were the various control items any too accessible to the pilot until he had become accustomed to the layout.

Quaintest of all, at least to present-day notions, was the "power bolt," by means of which the hydraulic urge was made available for the various services. This lay unassumingly to one's right beside the hood runner, and looking exactly like some jettison or other hood control. More than one newcomer to the type failed to find it or, at least, to understand its purpose after an over-confidently unbriefed departure, and, to the vast annoyance of the ground staff, duly pulled out the emergency "chain" in order to obtain an undercarriage so necessary for normal landing purposes.

Massive Mobility

But, in contrast to all this, one *could* see out of the Hampden, and one felt always part and parcel of the machine. For what was then known as a "heavy," it was, too, really extraordinarily mobile on the controls, and we treated it quite shamelessly until somebody learnt that it was uncomfortably possible to stall the rudders when executing any violent sideslip manœuvres. There was a peculiar pleasure in making steep turns with such a comparatively large aircraft, and the turning view, from wing-tip to wing-tip, was unimpeachable.

Even the often-maligned Hereford was pleasant enough once it had become airborne. The trouble seemed to be that, particularly on the boggy airfields of the very early 'forties, the Daggers, as they were cowled in the Hereford, became much too hot on the ground and were somewhat over-cool in the air. The result was that things tended to distort and even, occasionally, to stop after a momentary spewing of con.-rods, gear wheels and other mechanical odds and ends. More normally, it just failed to start.

But in my flying the engines always continued to give a proportion of power whatever their state, and in the early ferrying days we used to bring them, without qualms, straight across the Irish Sea at wave level. The Hereford had one memorable fault—after a long flight conversation between crews had, for the rest of the day, to be continued in a series of shouts and whispers, such had been the effect of the high-pitched exhaust note and high revolutions on our ear-drums.

We even became accustomed, while occasionally travelling in the Hampden as a passenger, to the inadequate-looking rear fuselage and to the continuous twitchings of the empennage at the end of it. This always looked as if it ought ultimately to break, but only once have I seen a Hampden lose its tail, and that after a particularly melodramatic arrival, with slots clutching nothing, from several hundred feet on to a runway. Rear gunners used to say that it was nice to have the "pencil" fuselage because there was so much less for the flak to hit.

On a later test-flying occasion when (through a technical hitch) the starboard engine cowling was shed in its entirety, I certainly felt, while returning to base, more than a little worried about the strength of the back parts. I had, in fact, actually felt the cowling hit the tail while on its way into space, and the rudder control thereafter appeared to be distinctly peculiar.

In spite of damage to the centre-section and the fins everything stayed on. It never occurred to me until afterwards that, even if the tail had suffered no particular damage, the airflow over the starboard centre-section would have been distorted enough to make any elevator and rudder control odd to the touch. The most powerful memory of that incident was the so very naked and undernourished look of the Pegasus just after it had lost its usual cover and while I was still searching around for a possible cause of the sudden shock.

Photo Reconnaissance

Peacetime Occupations of P.R. Squadrons : Big Tasks in Hand

AMATEUR photographers in Britain must wonder why there is still an acute shortage of film and other photographic requirements. The truth is that the Photographic Reconnaissance units of the Royal Air Force are still just as busy as they were in wartime.

It is, of course, no longer necessary to check all the shipping in European ports, or to photograph raid damage, but the authorities are taking the opportunity of mapping by air photograph the whole of the areas occupied by our forces. In addition, by arrangement with neutral governments, the survey is being carried as far north as the Arctic Circle.

We have an arrangement with the Americans, who are doing the same work in their own zone, to supply us with a duplicate negative of all the photographs which they take. We, in turn, duplicate each negative and hand one to the Americans. The Russian zone is not being photographed by us, and there is no reciprocal agreement in existence.

Not only in Europe is this intensive mapping going on. The Royal Canadian Air Force is engaged in plotting the whole of Canada and enormous areas are in process of being mapped in the Far East. The whole of Burma and Indo-China will be done, and we shall have more information about remote tracts of land than ever before. In many of these countries, both European and Asiatic, there were no reliable maps before the P.R. squadrons worked ahead of the Allied armies. In fact, in many cases, air photographs had to take the place of maps entirely.

Whatever may be the case in many squadrons of redundant aircrews having no occupation, this is certainly not so in P.R. squadrons. Even the weather gives them but very few chances of a rest. The long range of their aircraft enables them to take the aircraft to the fine weather if the fine weather does not come to the squadron's area. There is always a good patch somewhere between Narvik and the African coast, and advantage is taken of this. In the Far East, out of the monsoon periods, over 50 per cent. of the days are suitable for mapping from great heights. The weather in the Ceylon area is so consistently good that three out of every four days are suitable.

Despite its vital importance to all three Services, the photographic side has always been treated as a Cinderella by the R.A.F. Even now, after its tremendous achievements during this war, it is only represented by a Deputy Director in the Air Ministry. Group Capt. F. C. V. Laws, C.B.E., F.R.P.S., its head, played a similar and equally important part in the war of 1914-1918 and has put in no fewer than 34 years' service, mostly handling this subject. Undoubtedly it has been due to the foresight of his staff, and his own world-wide experience, that the Royal Air Force has been so magnificently equipped, thus enabling it to reach the present high standard in all branches of air photography.

The advances made in air photographic technique result from production of new emulsions, processes, cameras and lenses and the general mechanisation of processing and printing. The whole technical organisation has come under the continual review of the Air Photographic Research Committee, which is made up of representatives from the Air Staff, the trade, M.A.P., and Scientific Advisors. Emulsions as fast as 20,000 H.D. have been produced during the war and there is now no question at all that British lenses equal the world's best.

HERE AND THERE

WAR ARTIST AT WORK: Frank Wootton, celebrated R.A.F. war artist, painting dispersed Spitfires on a rain-soaked Burma airfield. Next week's issue of *Flight* will include a four-page coloured supplement of pictures by Wootton, Terence Cuneo and Roy Nockolds, selected from the S.B.A.C. collection.

Air Mail Charges

MR. R. E. HANNIGAN, the U.S. Postmaster-General, who returned by air to America from Eire last week, has said that he thinks the present air mail rates are too high to encourage general usage, and he will try to get them halved.

With this laudable object in view, he hopes to return to Eire next January to arrange a new schedule of air mail postal rates between Eire and the United States

Officially Confirmed

THE Federation Aeronautique Internationale last week confirmed the mean speed attained by Group Capt. H. J. Wilson in the Gloster Meteor IV at Herne Bay on November 7th, at 975.675 km./hr., which is equivalent to 606.262 m.p.h.

M.A.P. was informed through the Royal Aero Club, and Mr. John Wilmot, Minister of Supply and Aircraft Production, announced that the speed had been homologated as a world's record by the F.A.I. after scrutiny of the records of Group Capt. Wilson's flights.

Reading R.Ae.S.

NO qualifications, beyond having attained the age of 16 years, are required to become a member of the newly formed Reading and District branch of the Royal Aeronautical Society, of which Mr. F. G. Miles, F.R.Ae.S., is the president.

"All the branch asks of the intending member," says its secretary, Mr. B. Buck, "is interest and enthusiasm in some aspect of aeronautics."

The new branch held a general meeting yesterday evening at Miles Aircraft, Woodley, at the invitation of its president.

A.T.C. Disappointment

THE A.T.C. are to receive only eight captured German gliders—six Grunau Babies and two Kranich two-seaters, reports the *A.T.C. Gazette*. The reason given is that gliding clubs formed in Germany for the occupying forces have been given first claim to this useful equipment.

The Fuller Life

ABERDEEN UNIVERSITY AIR SQUADRON, which gave pre-entry training to some 2,000 cadets during the war, is now blossoming out into actual flying instruction with Tiger Moths. The squadron's C.O., Flt. Lt. I. M. Newnham, is their chief flying instructor, and is to be assisted by F/O. W. S. Truffit.

During the war this squadron shared a training aircraft with two other Scottish universities, but the training was limited mainly to navigational exercises.

Cadets will now be taught to fly up to the "Wings" standard, but being reserve pilots will not actually receive R.A.F. wings. They will, however, qualify for civil pilots' licences.

Mr. Rowarth Leaves M.A.P.

AFTER more than 20 years in the research and development departments of the Air Ministry and Ministry of Aircraft Production, Mr. F. Rowarth has resigned from the post of Deputy-Director of Research and Development (Installations) and has been appointed general sales manager of Automotive Products at Leamington. Mr. Rowarth took over his new post last Monday.

He will deal with all the firm's products and not merely those relating to aviation, but we hope that when air racing begins again he will find time to help Capt. Dancy with the handicapping.

Soviet Reconstruction

THE civil air fleet of the U.S.S.R., which up to now has been working for the Red Army transporting personnel and supplies, will be wholly transferred to peace needs in 1946, according to a recent announcement in *The Soviet News* published from the Press Department of the Soviet Embassy in London.

Big extensions of passenger services are forecast for next year, such as between Moscow and Vladivostock, Chukotsk, Tashkent, Stalinabad, and Alma

GEODETIC GRAVEYARD: The old aluminium saucepan you gave for salvage in "the darkest hour" may return to you, rejuvenated, from this Oxfordshire dump of aircraft scrap which covers many acres. After careful sorting, all suitable alloy is reduced to ingots on the site and goes to the factories again—this time to be turned into peaceful products

HERE AND THERE

Ata, and a number of twin-engined aircraft used during the war as troop transports are now being re-equipped for this purpose.

The volume of work handled for the Services was multiplied by three between 1940 and 1945, and it is stated that when it resumes civil duties it will carry five times as many passengers, twice as much freight, and three times as much mail as at present.

Avros in Australia

ACCORDING to the Canberra correspondent of the *Sydney Morning Herald*, quoted last week by *Reuter*, a plan is being submitted by A. V. Roe, Ltd., in which British private enterprise would combine with Australian Government facilities to produce modern aircraft in the Commonwealth.

The suggestion is to form a public company in which the Commonwealth would hold controlling shares, and it is believed that administration of the factories by experienced private manufacturers would enable Australian-built aircraft to compete on improved terms with the U.S. and other countries in the world market.

WASHINGTON WELCOME : Arriving at the U.S. capital's airport on his recent visit to the States, Marshal of the R.A.F. Sir Arthur Tedder is greeted by Lt. Gen. Carl Spaatz of the U.S.A.A.F. Sir Arthur was accompanied on his trip by Lady Tedder.

News in Brief

MARSHAL OF THE R.A.F. SIR ARTHUR TEDDER, who has recently returned from a visit to the U.S. and Canada, made a call at the White House, Washington, before leaving America, to pay his respects to President Truman. (See above picture.)

* * *

A Paris newspaper was responsible for a rumour that the Halifax bombers presented by Britain to two French Air Force squadrons were to be used "for commercial communications with French Equatorial Africa and French West Africa." This has been officially denied by the French Army authorities, who said that they might possibly be used as auxiliary military transport, but that there was no question of commercial use.

* * *

The Cambridge Aero Club is to be reopened as soon as possible, it is announced, and arrangements are in the hands of Sqn. Ldr. L. V. Worsdell, D.F.C., who has now rejoined the staff of Marshalls Flying School, Ltd.

* * *

The Empire Air Armament School's Lancaster, *Thor*, which has been on a six weeks' educational tour to the Middle East and S. Africa, captained by Wing Cdr. M. H. de L. Everest, arrived back at its base at Manby, Lincs, last week. Other aircraft from Manby are to tour the British Empire on similar missions.

* * *

Commendably apt is the name, Hoverfly, which the R.A.F. has officially bestowed on the Sikorsky helicopter. Types R-4B and R-6 are the Hoverfly I and II respectively.

* * *

A Hawker Hurricane has been provided by the British Government for the personal use of the Civil Air Attaché in Washington, Mr. Peter Masefield.

* * *

After 34 years' service with the British Aluminium Co., Ltd., Mr. E. V. Pannell is retiring at the end of the year, and Mr. C. F. Batstone has been appointed the new Midland branch manager at 47, Water Street, Birmingham, 3.

* * *

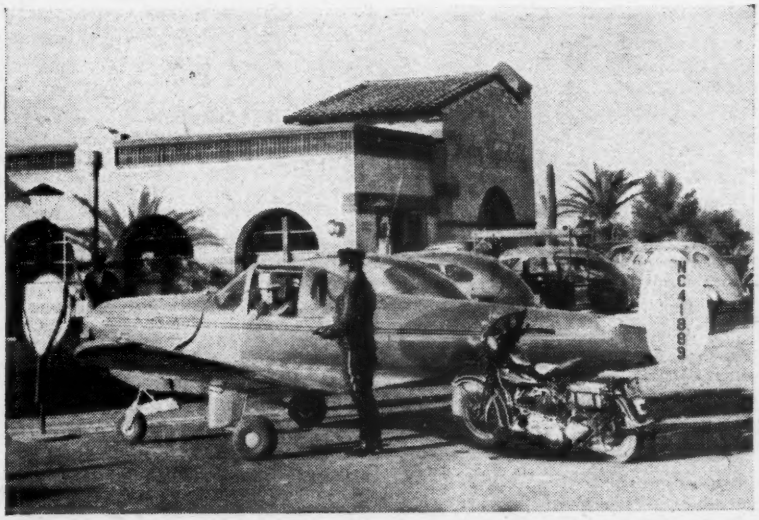
Captain K. Bartlett, Bristol's sales director, has just left for a tour of South America. The fact that the Bristol Freighter has made its test flights and is in production should help him materially in convincing that part of the world that the British aircraft industry is in a position to execute civil orders and begin export in the near future.

* * *

The withdrawal of the R.A.F. from Iceland, it has been announced, will be virtually completed by next March, except, perhaps, for some Signals personnel.

* * *

In the reference to wartime production of parachutes under the heading "Parachute Problems" in *Flight*, December 6th, it was inadvertently stated that 40 per cent. of the output was under subcontract from the Irving company. This should have read as under direct M.A.P. contract to drawings supplied by the Irving company.



DOWN IN ARIZONA : This "bad man" is H. O. Nelson, who landed at Broadway Village for the state's first aviation conference and promptly collected a (presumably pre-arranged) "ticket" for parking his Ercoupe in the wrong place.

CIVIL AVIATION NEWS

PRIMARY BOAT TRAINING: This interesting little French flying boat, the S.C.A.N. 20, is intended primarily as a four-seat trainer, but might have possibilities as a private aircraft. It is credited with a maximum speed of 137 m.p.h., a stalling speed of 50 m.p.h., a ceiling of 16,000ft. and a range of 620 miles.

THE LISBON AGREEMENTS

SUBJECT to any later and overriding world air transport agreements, the British Government has now arranged with Portugal for permission to operate services from this country with Lisbon both as a terminal and as a staging post. It was agreed that all British services crossing Portuguese territory should make a stop there.

Such a base as Lisbon will, of course, be of vital importance to British air services, particularly on the South American run, and it is likely that two of the three projected Government Corporations will make good use of this centre as the terminal of a European service and as a stopping-point on Empire and South American runs.

ATLANTIC RATES

PAN AMERICAN AIRWAYS have stated that they are ready to revert to their pre-war single fare of £94 for the Atlantic crossing if Britain will assure the company of a "fair share of American flag frequencies." In the meantime, P.A.A. have, of course, been quite at liberty to charge any fare they wished on the agreed twice weekly runs—the "ban" was applied only on the additional services which were being run. The "battle" seems to have been more between the American companies themselves than between P.A.A. and the British Government. This country will certainly not be in a position to make daily Atlantic crossings, at economic or uneconomic fares, until next summer at the earliest. With its three Boeing Clippers, B.O.A.C. is at present jogging quietly round the South Atlantic on a once-weekly basis—running more or less directly, via the Azores on the eastward run to Baltimore, and via West Africa, Trinidad and the West Indies on the westward run.

The entire fare situation will be discussed when the Traffic Committee of the International Air Transport Association meets in January.

IN THE WEST INDIES

TO the average person whose knowledge of more distant foreign parts is confined to a study of an atlas, the West Indies consist of a series of islands running in a semi-circle from Trinidad to Cuba. On paper it appears almost as if each of these islands is rowing-boat distance from its nearest neighbour.

In fact, of course, the distances are very considerable, and there should be useful possibilities of airline development and export sales in the vast area concerned. During the winter months, B.O.A.C., of course, fly through the area on their East-West Atlantic crossing—which must, with flying boats, be made over the southern route during the winter, and the more direct Azores runs are a little too long-stage to be dealt with against the prevailing wind conditions.

But there is, in the area, a Trinidadian Government airline—British West Indies Airways—linking up the islands where landing facilities exist and where politics permit. At the moment this airline is handicapped by lack of good radio facilities and shortage of suitable aircraft, but with, we believe, four Lockheed Hudsons and one Lockheed Fourteen crewed mainly by R.C.A.F. personnel the islands are usefully linked from Piarco airfield, Trinidad. Landings are made at Tobago, Barbados, Granada, St. Lucia and Antigua, with a long trip, once a week, westwards to Jamaica.

Farther south, in British Guiana, there has, for a long time, been a private charter concern in operation, using fifteen-year-old Ireland Neptune flying boats—the only ones in existence and probably the only ones ever made. Rather similar in general layout to the Walrus, these Neptunes were once amphibians, but Mr. Art. Williams who, with two other pilots, runs the service, removed the landing gear to increase the payload. The boats use Georgetown harbour as a base. There are now, in fact, two airfields in British Guiana, one, Atkinson field, merely a strip, not far from Georgetown, and the other, Mackenzie field, some 60 miles up the estuary.

STILL VAGUE

THE latest information concerning the eventual resumption of private flying does not get us very far. After January 1 it will no longer be necessary to obtain a special permit or to have recognised permission to fly a civil aircraft, but the airfield and other facilities available will be very limited, and it will be necessary to introduce a system of fuel rationing. Exactly how this fuel rationing will be carried out remains to be seen.

Meanwhile, those still-active or new club committees who wish to keep a list of interested prospective members might let *Flight* have their operative addresses so that the numerous enquiries may be usefully passed on.

B.A.L.P.A. ENTERTAINS

WITH the inspired idea of socially co-ordinating—at least momentarily—the flying and other interests in air transport, the British Air Line Pilots' Association organised a private party last week. The interests certainly got together in no small numbers and comfortingly friendly conversations could be seen in progress between most diverse interests during the successful two hours' duration of the party. It would be invidious to mention names, but nearly everyone in civil aviation, including the Minister himself, could be found in the party at one time or another. The idea was certainly inspired.

SHAPE AND SIZE

IN his lecture to the Derby Institute of Transport last month, Mr. J. W. S. Brancker, of B.O.A.C., provided a useful and commonsense picture of the real problems which will face air transport operators during the next few years. He rightly scouted any suggestion that everybody will eventually travel by air and described the public requirements in various means of transport as a spectrum band, with the air still covering only a comparatively narrow section.

He was mainly concerned with the question of relative aircraft size, and explained very clearly how this was dependent on length of route, frequency and general conditions. In many cases high frequency, using small "units," would be much more efficient than the use of large "units" at low frequency. The question of time-losses in relation to distance, both on the ground and the air, he explained in detail. He thought that on internal and Continental services aircraft of 15-30-seater size would be most useful, with the 35-40-passenger type for Empire operation, and with really large aircraft used only for very long-stage oceanic services.

Mr. Brancker stressed the vital importance of high utilisation, particularly since the first cost of aircraft was continually increasing, and explained that, since passengers' comfort in the matter of departure and arrival times had to be considered, really high utilisation would not always be possible unless freight and mail could be carried overnight. He went into the problem of passenger comfort versus payload.

Emphasising the fact that these problems were common to

CIVIL AVIATION NEWS

all forms of transport and were only particularly acute in the case of air transport. Mr. Brancker concluded by saying that, with clear thinking and accurate planning for the future, we could build an air transport system which would be a useful asset.

DC-3s FOR TATAS

THE U.S. Surplus Property Board have allocated four Douglas C-53 Skytrains (DC-3s) to Tata Air Lines for conversion and use as civil transports. Two of these aircraft have already arrived at Tata's Juhu base, and two more are expected very shortly.

EXTENSIONS IN EIRE

CONTRACTS have recently been placed for the lengthening by 2,000ft. of the main runway at Rineanna—giving it a final length of 2,430 yds. It may be recalled that a short time ago one of the U.S. Civil Aeronautics Authority officials suggested that a longer runway might be required for future aircraft.

Dublin's Collinstown airport, which at present has a grass surface, is to be laid out with three runways, the longest of which will be that from N.E. to S.W.—1,760 yds. The runways will be 200ft. wide, and taxi strips 50ft. wide will connect the runways with the apron.

AIR CO-ORDINATION

TO many of us it often appears that civil aviation is at present being overwhelmed with directive talk, and that airline operation has become a matter for lawyers rather than for flying people. The way in which air transport has, in fact, become an interest for the entire world was stressed by Mr. Edward Warner, the President of P.I.C.A.O., in his address to the National Foreign Trade Convention in New York last month.

As he remarked, the establishment of an international airline means much more than the acquisition of a fleet of luxurious aircraft. It calls for authorisations which only Governments may give and for facilities which only Governments are likely to supply. International air transport is part of the very fabric of international relations. Until a satisfactory full agreement is reached, airline operation will remain generally dependent on any special agreements made amongst the States concerned. Hardly anyone favours this situation in theory. Everyone would prefer a universally accepted code under which the rights of international carriers would be made clear, but so far the wit of man has not sufficed to develop such a code.

However, Mr. Warner added, it was pleasant to know that one major breach had been made in the wall of bilateralism. By accepting the International Air Services Transit Agreement, twenty States had given one another free right of passage—guaranteeing, at least, that no barrier would be placed in the way of the bare physical movement of aircraft.

INTERNATIONAL METEOROLOGY

RECENTLY the Air Navigation Committee of P.I.C.A.O. submitted a recommendation that ten regional meteorological offices should be established in different parts of the world. The suggested bases were in North and South America, Europe, Africa, the Middle East and Russia, with special services in the Atlantic, the Pacific and the Arctic. The committee called for the co-operative establishment of a permanent organisation of "weather ships" and weather reconnaissance flights. In the meantime the meteorological work should, it was recommended, be continued by the various Air Forces until the proposed civil agencies could take over.

NOW WASHINGTON—PARIS

LAST week Trans-Continental and Western Air "Prospected" their new service between Washington and Paris, via Gandar and Rineanna, using a Lockheed Constellation. This flight was by way of being a rehearsal, and the regular service will be started early in the New Year. T.W.A. will eventually operate in co-operation with Air France when this company has the necessary fleet and facilities. T.W.A. are, we believe, the first operators to take delivery of Constellations.

In the meantime Pan-American Airways are planning a service between New York and Calcutta, via Central Europe and Turkey, and an aircraft was due to leave New York last week on a survey flight over the route.

ANNIVERSARY AT PRESTWICK

SEVERAL interesting remarks were made by speakers at a dinner, held on November 29th, to celebrate Prestwick's fifth anniversary as a trans-Atlantic terminal. For instance, a former Socialist Secretary of State for Scotland, Mr. Tom Johnston, emerged as an advocate of civil aviation "home rule" for Scotland. After praising the decision to nationalise civil aviation, Mr. Johnston said that Scotland's was not a case where long-distance bureaucracy could even pretend to operate, and he thought that there would be plenty of opportunities for initiative and for a new experiment in combining public ownership with personal management. He was certain that the Government would make the fullest use of Scottish aviation and of Prestwick. In his reply, the Minister of Civil Aviation, Lord Winster, was careful to avoid any discussion on these lines, but hoped that industrial development in Scotland, in which civil aviation would certainly play a great part, would increase prosperity.

TANKER INTO CARRIER

ONE of the important factors in the success of the Atlantic convoy system was the "M.A.C. ship," otherwise the merchant aircraft carrier.

Recently the Fairey Aviation Co. invited friends to see a short film, made in typically excellent fashion by the Shell Film Unit, showing how oil tankers were converted into M.A.C.s by slicing off the superstructures and laying a 460ft. flight deck; the whole process was seen, from the unshipping of the funnel in the dockyard to the flying-on of the Fairey Swordfish at sea. It is not, perhaps, generally known that, while each ship reserved one of its tanks to supply its operational aircraft, the remainder of the compartments carried a cargo of 10,000 tons of oil in the ordinary line of convoy duty.

Three other films were also shown. One was an instructional "short" on elementary aerodynamics, entitled *Lift*, which gave a better idea of how and why an aerofoil functions than could any number of textbook pages. It is the first of a series of eight now being made by Shell Film Unit. Another was *The First Ten Years*, a vividly interesting if somewhat scratchy collection of early shots of aviation in the Santos-Dumont and Voisin era.

The third was an Admiralty film of how (and how not) to make deck landings, in which the camera (sometimes in slow motion) had captured some quite awe-inspiring impressions of frantic "batsmen," wilting undercarriage legs and fragmenting airscrew tips.

M.A.C. Ship, *Lift* and (with very limited distribution) *The First Ten Years* can be borrowed in 16 and 35 mm. sizes free of charge by Service units, training organisations, etc., from Petroleum Films Bureau, 46, St. James's Place, London, S.W.1.

ERNEST TURNER GROUP DINNER

WARTIME conditions, such as bombs and black-out, modified the annual "get-together" of the Ernest Turner Group into a luncheon during the past few years, but this year's function reverted to a dinner, and the "fourteenth annual" was held at the Waldorf Hotel, London, last week.

The toast to the Ernest Turner Group was put by Sir William Letts, a well-known figure in the motor industry and a past-president of the S.M.M.T., who began by saying that he was really a very sick man. However, after indicating quite clearly that it was the present Government he was sick of, he announced that he now felt very much better. Grp. Capt. C. A. B. Wilcock, the Labour member for Derby, responding, said that he was not in favour of the whole of industry being nationalised (applause), although that was not to say that industry was always efficient just because it had done rather well for itself, particularly the motor industry. (Slightly nervous laughter.) He concluded by praising the progressiveness of the Ernest Turner concern, with whose activities in Derby he was familiar, and the admirable team spirit which ran right through the whole organisation from the chairman downwards.

Mr. Alan Turner, who had previously responded to Sir William's toast, had stressed the fact that they now employed 30 per cent. more people at Derby than at the wartime peak period. "We have not relaxed since VJ-Day," he said, "but have driven right ahead in spite of the difficulties because we believe that the Englishman's innate love of freedom will come out on top. We have reopened the Manchester branch, and we now intend to open showrooms in the West End of London."

Lancaster Group Celebrate

Avro Dinner to Mark Completion of Lancaster Bomber Production

Air Marshal Sir Norman Bottomley, A.O.C. in C. Bomber Command, chatting with Roy Chadwick, chief designer, and Sir Roy Dobson, Managing Director, of Avros.

IT was a happy gathering of aircraft manufacturing celebrities, among them a number of R.A.F. Commanders, who celebrated, last Thursday, the completion of Lancaster bomber production. The occasion was a dinner at Claridge's, London, given by A. V. Roe and Co., Ltd., and presided over by Sir Roy Dobson, C.B.E., the managing director. It is not generally known that the efforts of the great Lancaster group were augmented by over 600 direct sub-contractors, and it was to mark the appreciation of the parent firm on the termination of a huge war task that the dinner was arranged.

Mr. E. M. Plowden, Civil Executive of M.A.P., who deputised for the Rt. Hon. John Wilmot, M.P., proposed the toast of A. V. Roe and Co., Ltd., and congratulated the whole group, observing that the magnificent production figures achieved represented the greatest industrial effort of the whole war. Of the 7,366 Avro Lancasters delivered to the R.A.F., over half were built by the parent firm, plus 7,000 aircraft of other types. He stressed the importance of the operational value of the bombers and some of their doughty deeds in making their 150,000 sorties. Almost exactly two-thirds of the total tonnage of bombs dropped by the Royal Air Force since the beginning of 1942 were dropped by Lancaster crews. He named for special praise Mr. Roy Chadwick, the chief designer; Mr. C. E. Fielding, assistant general manager; Mr. J. Green, chief engineer; and Mr. Kay, general superintendent.

TWO PILOTS: T. O. M. Sopwith (left) with S. A. (Bill) Thorn, Avro's Chief Test Pilot.

In his response, Sir Roy Dobson paid fitting tribute to the team spirit and co-operative effort which permeated the whole manufacturing group and to the technical officers who so closely collaborated in the big production programme. To maintain their production figures at critical periods the parent and daughter firms interchanged components and assisted one another in other ways, but the finished bombers were there. He extended high praise to the pilots of 617 Squadron and particularly the Commanders of No. 5 Group of Bomber Command who, he said, always knew more of the Lancaster than the makers themselves, and certainly knew how to use it.

He was generous in his praise of M.A.P., mentioning the valuable early work of Sir Wilfred Freeman and his foresight when the expansion programme was being planned. A.I.D. and the Regional Controllers came in for their mead of praise for a big task well and truly performed, as the striking figures he quoted clearly revealed:

Lancaster bombers dropped 608,612 tons of bombs, in addition to

51,513,106 incendiary bombs.

12,700 sea mines.

150,000 sorties were flown, averaging four tons of bombs.

228,000,000 gallons of fuel were consumed.

74,178 ex-prisoners of war journeyed home by Avro Lancasters.

6,684 tons of food were flown to the aid of the Dutch.

A Peak Month

Sir Roy thanked the group which comprised, apart from A. V. Roe and Co., Sir W. G. Armstrong-Whitworth Aircraft, Metropolitan-Vickers, Vickers-Armstrong, Austin Motor Co., and Victory Aircraft of Canada.

He added that in the peak period of August, 1944, no fewer than 293 Lancasters left the factory in that one month, plus equivalent spare components.

He was glad the war was over and that such a successful joint effort could be celebrated. As to the future, his notion was that five-hour flights represented a useful hop to aim at and speed was the criterion. To sell speed in air transport would be his aim, since economy, comfort and security could be equalled by other transport services.

Other toasts were "The Daughter Firms," proposed by Sir Frank Spriggs, which drew a witty response from Sir George Bailey, who told of early troubles and trials in changing from heavy to light engineering and how his company was attracted by the Lancaster design; "The Ministry of Aircraft Production," proposed by Mr. T. O. M. Sopwith, and replied to by Air Marshal Sir Ralph Sorley; and "Bomber Command" by Mr. Roy Chadwick, responded to by Air Marshal Sir Norman Bottomley.

The new chief of Bomber Command regretted the absence, due to illness, of Air Chief Marshal Sir Arthur Harris, who, however, had sent a message, as a 3½-year user of the Lancaster, that had it not been for that shining sword, we could not have prevailed, adding that the Lancaster bomber was the greatest single factor in winning the war. Sir Norman extended his appreciation to those doing the less spectacular jobs, the original training of air crews, mentioning Air Chief Marshal Sir Ludlow Hewitt in that regard, the team work of the bomber crews, the fine leadership and the devotion of thousands of personnel. He pointed to the testimony of defeated German Army leaders as to the effectiveness of R.A.F. operations over Germany, and the first-rate equipment that our aircraft manufacturers had made available.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

NATIONALISED AIRWAYS

The Defence is Cross-examined

IT is all very well for Mr. Haynes, in his letter in *Flight*, November 29th, to accuse Mr. Feverheerd of pitting himself against the "State," but I would like to remind him that the Government began this contest.

In connection with his defence of nationalisation :—

(i) Can he tell me why, if the nationalised airline is in itself so much better than the product of private enterprise, it does not dare to face on equal terms unfettered competition of this nature, despite the latter's manifestly inferior resources?

(ii) Can he explain *why* we should expect greater comfort when there will be no alternative to whatever the Government may choose to give us? Also, *why* civil servants should miraculously assume a guise hitherto utterly undiscernible in their make-up?

(iii) Would he indicate the factor in the new system which will replace the need of economic survival, which was the mainstay and perpetual stimulus to better work in the supposedly outdated regime of private enterprise?

(iv) Does he really believe that "owing to the larger organisation there will be less wastage"? This fallacy has been exposed time and again.

(v) Does he realise that the raising of fares can be avoided by the simple expedient of increasing the Government subsidy and that Government policy is tending towards a point where the taxpayer will be largely ignorant as to the amount concerned and especially as to how it is used?

(vi) Does he really think that Government control is unavoidable, or is he merely a willing convert to the creed of red-taped, hide-bound bureaucracy?

England is not made of such stuff. This pernicious idea must soon be exposed and its fallacies examined by the public, which will surely soon perceive that it can more easily control aviation through its private and competing companies than through the maze of departments in its own Government.

B. E. J. GARMESON.

CAMPAIGN AWARDS

When Training was "Operational"

I NOTE from your Correspondence columns that honours and awards are still a bone of contention among flying instructors.

This started in 1940 when flying training was carrying on in spite of constant enemy interference, and the work of flying instructors was a lot more "operational" than that of many operational squadrons.

A special medal for Training Command has probably been considered and rejected as impracticable, but a simple solution would appear to be a rosette to be worn on the Defence Medal.

If one rosette were issued for every twelve months' instructional work in Training Command, many instructors would indeed be proud of their Defence Medal.

G. W. BUCKINGHAM (Wing Cdr., R.A.F.).

AIR SPEED RECORD

Controllability at High Mach Numbers

MAY I make an observation in connection with the Meteor record and the articles about it, including *Flight's* editorial and "How the Record was Made" in the Nov. 15th issue?

Most of these articles appear to be guilty of misleading the public to some extent over the matter of controllability at high Mach ratios. It is frequently implied that the record Meteors were experiencing control difficulties through attempting to fly at a higher Mach ratio than ever before attained. In actual fact, the Mach number of 0.8, although probably the highest ever reached in level flight in a piloted aircraft, is certainly not the highest attained in controlled piloted flight generally, including dives.

At least one authenticated case occurs to me of a much higher Mach ratio, 0.92, being obtained in controlled flight, this being on a Spitfire (not Spiteful) undergoing dive tests at R.A.E. some 18 months or more ago. R.A.E. quote the speed as 620 m.p.h., which must have been at a considerable height.

There is no intention to detract from the fine achievement of the speed Meteors when I point out that, in the matter of control problems at high Mach, they were not breaking new ground, but following in the footsteps of the 10-year-old Spitfire. I am surprised that no one appears to have raised this point previously.

Perhaps the Gloster technicians would oblige by stating whether the allowable dive speed of the speed Meteors was in excess of the 610 m.p.h. quoted as limiting level speed.

STRESSMAN.

[Surely *Flight* made it quite clear that the interest lay in the fact that the Meteor, even at that high Mach number, was sufficiently controllable to be flown on a course at a constant height of less than 250 ft.? No one doubts that this figure has been handsomely exceeded many times during diving tests, but few, if any, of the aircraft concerned have been free from compressibility effects which would have made the equivalent speed concerned quite impossibly difficult, if not dangerous, to hold at low levels. We have previously quoted the Spitfire case mentioned, but, though this aircraft has extraordinarily good high-speed characteristics, we understand that the figure has been miscalculated and should have been 0.85. In any case, even the Spitfire develops a considerable and uncontrollable nose-down characteristic at Mach numbers of this order.—ED.]

AIRCRAFT ENGINEERS

Quantity or Quality?

AFTER reading P. Parker's views on pre-1939 and post-1939 aeronautical engineers (*Flight*, Nov. 22nd) I must say that to judge an engineer by a date is very unfair; surely it depends on the man himself.

However, the wartime cry, as she puts it, was very prevalent in an aircraft plant of my acquaintance.

This cry, "When in doubt let it go," appeared to be the main theme of the W.I.D., inspired as it was by the chiefs—the main reason being, I noticed that the said chiefs were unwilling to offend the management, who desired production and were, therefore, apt to rock their pedestal of authority.

GEO. PAGE.

Clarification by Example

PATRICIA PARKER'S letter (*Flight*, November 22nd) on the question of the respective merits of pre- and post-1939 aircraft maintenance engineers, following the publication of a resolution by the executive of the Aeronautical Engineers' Association on the subject, shows a gratifying interest in the problems confronting the men in overalls. However, I would like to correct one misapprehension. The post-1939 engineers in aircraft maintenance have no quarrel with their "pre" colleagues; on the contrary there is a great deal of mutual admiration. Where the trouble arises, and where this Association says that the Air Ministry is wrong, is in the department's policy of considering any pre-1939 engineer—be he automobile, agricultural or what have you—as the superior *at aircraft engineering*, to the wartime trained aircraft specialist.

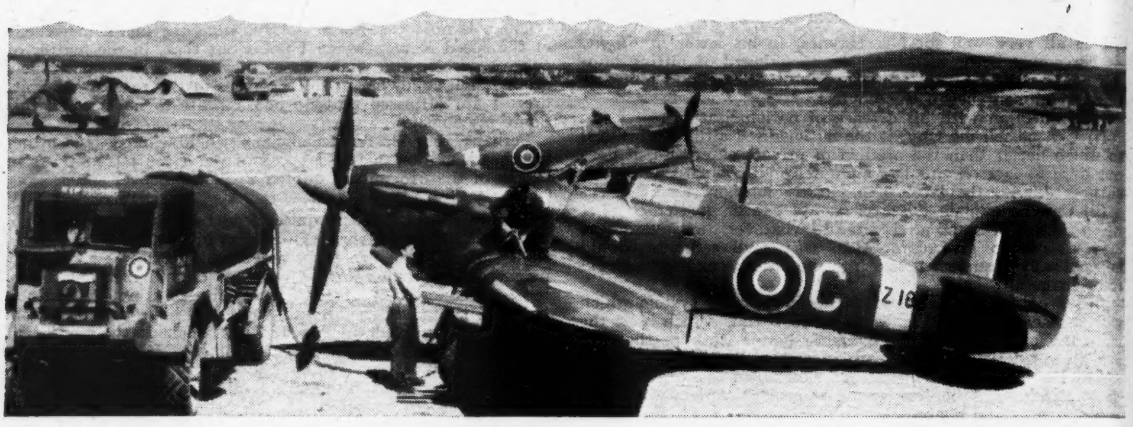
To illustrate this point, I would direct your attention to recent happenings in the No. 23 Maintenance Unit in Northern Ireland, where the Air Ministry has dismissed 46 tried and trained personnel—with five, six and seven years' experience—in order to provide openings for a heterogeneous collection of fitters with absolutely no claim to aircraft maintenance skill. In fact, the Air Ministry has found it necessary to establish a training school to fit these newcomers for the comparatively simple engineering which at present constitutes the work of the peacetime M.U. And more of the old staff have been warned that in due course they, too, must go, as and when the Air Ministry has more of its new type engineers to employ.

I hope that this will make the position quite clear, and I believe that, knowing the facts, the Aeronautical Engineers' Association could count on Patricia Parker, too, "to condemn most vigorously the Air Ministry policy."

J. H. STEVENSON
(General Secretary, A.E.A.).

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements



IN AT THE KILL: Rocket-firing Hurricanes on a Yugoslavian airfield, at the end of the war in Europe. Although the Hurricane has had its day as a fighter, the part it played in the Battle of Britain will never be forgotten.

Appointments

THE following appointments are announced by the Air Ministry:—

Air Vice-Marshal G. B. A. BAKER, C.B., M.C., to be Director of Training (Plans) in the Department of the Air Member for Training.

Air Vice-Marshal W. J. B. CURTIS, C.B.E., to be A.O.C. No. 40 Group, Maintenance Command.

Air Vice-Marshal Baker was appointed Chief of Staff, Mediterranean Allied Air Forces in July, 1944. He was previously Air Officer in Charge of Administration at H.Q., Technical Training Command, and Senior Air Staff Officer, H.Q., Coastal Command.

Air Vice-Marshal Curtis was appointed A.O.C., No. 55 Wing, Maintenance Command, in September, 1944, and was previously a Director of Equipment at the Air Ministry.

Awards

Naval Air Arm

THE KING has been graciously pleased to approve the following awards:—

FOR outstanding skill and courage whilst serving in H.M. Ships *Formidable*, *Implacable*, *Victorious* and *Indefatigable* in air operations against the Japanese during July and August, 1945:—

Distinguished Service Order

Act. Lt. Cdr. (A) D. G. PARKER, D.S.C., R.N.V.R.

Bar to Distinguished Service Cross

Temp. Sub. Lt. (A) H. A. RHODES, D.S.C., R.N.Z.N.V.R.

Distinguished Service Cross

Act. Lt. Cdr. J. C. N. SHRUBSOLE, R.N.
Act. Lt. Cdr. C. P. CAMPBELL-HORSFALL, R.N
Act. Lt. Cdr. W. R. J. MACWHIRTER, R.N.
Act. Lt. Cdr. J. P. CAMP, R.N.
Temp. Act. Lt. Cdr. (A) A. J. GRIFFITH, R.N.V.R.
Temp. Act. Lt. Cdr. (A) S. JEWERS, R.N.V.R.
Temp. Act. Lt. Cdr. (A) D. K. EVANS, R.N.Z.N.V.R.
Temp. Lt. (A) D. A. DICK, R.N.V.R.
Temp. Lt. (A) P. HUGHES, R.N.V.R.
Temp. Lt. (A) P. H. LONDON, R.N.V.R.
Temp. Lt. (A) R. P. CURRAN, R.N.Z.N.V.R.
Temp. Lt. (P) C. E. BUTTERWORTH, R.C.N.V.R.
Temp Sub. Lt. (A) J. C. ARBUTHNOT, R.N.V.R.
Temp. Sub. Lt. (A) J. W. BLAIKIE, R.N.V.R.
Temp. Sub. Lt. (A) J. R. CROSLAND, R.N.V.R.
Temp. Sub. Lt. (A) W. DAVIS, R.N.V.R.
Temp. Sub. Lt. (A) W. A. M. FERGUSON, R.N.V.R.
Temp. Sub. Lt. (A) P. G. JUPE, R.N.V.R.
Temp. Sub. Lt. (A) L. MACKINNON, R.N.V.R.
Temp. Sub. Lt. (A) H. K. QUILTER, R.N.V.R.
Temp. Sub. Lt. (A) J. E. STUBBINGS, R.N.V.R.
Temp. Sub. Lt. (A) P. B. WORKMAN, R.N.V.R.
Temp. Sub. Lt. (A) R. H. GLADING, R.N.Z.N.V.R.
Temp. Sub. Lt. (A) D. H. P. MCLISKY, R.N.Z.N.V.R.
Temp. Act. Sub. Lt. (A) C. D. MACLAREN, R.N.V.R.

Distinguished Service Medal

C.P.O. (A) H. DUNNING.
C.P.O. (A) T. L. WARD.
Act. P.O. Airman J. A. HOPPER.
Act. P. O. Airman F. G. LOCKHART.
Act. Temp. P.O. Airman J. G. TURNER.

FOR great gallantry on August 31st, 1945, when a Seafire Mark XVII aircraft with a full load of petrol crashed and burst into flames. Without hesitation Lt. Underwood ran straight into the burning wreckage and got the pilot out from the remains of the cockpit:—

O.B.E. (Mil.)

Temp. Lt. (A) J. F. UNDERWOOD, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Distinguished Service Order

Act. Sqn. Ldr. R. A. ESLER, D.F.C., R.A.F.V.R., No. 109 Sqn.—Sqn. Ldr. Esler has taken part in three tours of operational duty, during which he has attacked many of the most heavily defended targets in Germany, France and Italy. In September, 1944, his aircraft crashed and this officer was severely injured, his back being broken. Despite this, with a praiseworthy spirit of determination, he achieved a complete recovery and resumed operational flying with undiminished enthusiasm. Since then Sqn. Ldr. Esler has flown on sorties to Berlin and Berchtesgaden. In addition he has accomplished the duties of flight, and later deputy squadron navigation officer with outstanding ability, making a valuable contribution to this squadron's high standard of operational efficiency.

Act. Sqn. Ldr. M. P. FELLOWES, D.F.C., R.A.F., No. 109 Sqn.—Sqn. Ldr. Fellowes has completed two tours of operational duty. Since the award of the D.F.C. he has participated in a large number of missions of a varied nature. He is an outstanding captain of aircraft whose record of successes bears witness to his mastery of our bombing technique. He has also given ample proof of his valour and determination in pressing forward his attacks in the face of the fiercest anti-aircraft fire. Throughout, Sqn. Ldr. Fellowes has proved to be a fine leader whose ability, confidence and resolution have been reflected in the operational efficiency of his crew.

Act. Sqn. Ldr. J. A. MAHOOD, D.F.C., R.A.F.V.R., No. 109 Sqn.—Sqn. Ldr. Mahood has completed three tours of operational duty and has served in both the Western Desert and European theatres of war. He has been employed on target marking duties during the majority of his missions, and he has proved to be an exceptionally able navigator and set operator. In addition this officer has served as flight navigation leader, in which capacity he has been largely responsible for the high standard of navigation attained by the navigators in his squadron.

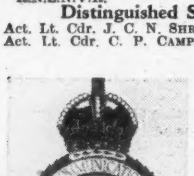
Act. Sqn. Ldr. J. Y. MALLEY, D.F.C., R.A.F.V.R., No. 139 Sqn.—Since being awarded a Bar to the D.F.C. this officer has completed a further large number of operational sorties. Many of these have been against the most heavily defended targets in Germany, including Berlin, which he has attacked on 27 occasions. Throughout a long period of operational flying he has had many arduous experiences and his aircraft has been damaged by anti-aircraft fire on several occasions. At all times Sqn. Ldr. Malley has displayed a high degree of courage and resolution, and by his accurate navigation he has materially contributed to the successful completion of numerous missions.

Act. Sqn. Ldr. J. O. MATHEWS, D.F.C., R.A.F.V.R., No. 157 Sqn.—This officer has completed his third tour of operational duty. During this period he has destroyed at least nine enemy aircraft and damaged four. Since the award of a Bar to the D.F.C. he has destroyed two enemy aircraft. On one occasion his bomber was damaged by fragments from an enemy aircraft. Only one engine of his bomber remained serviceable for the return journey from Stuttgart. Sqn. Ldr. Mathews, by his fearlessness and devotion to duty, has set an example to all.

Act. Sqn. Ldr. R. G. W. OAKLEY, D.F.C., D.F.M., R.A.F.V.R., No. 627 Sqn.—This officer has completed many sorties during his three operational tours. His targets have included Darmstadt, Stuttgart, Bremerhaven, Karlsruhe and Bremen. He has never allowed even the most intense enemy opposition to deter him from completing his allotted task. On numerous occasions Sqn. Ldr. Oakley has had to fly at low level in the face of enemy anti-aircraft fire when taking part in target marking sorties. As flight commander this officer has set a magnificent example of airmanship and gallantry.

Flt. Lt. D. BROWN, R.A.F.V.R., No 101 Sqn.—Flt. Lt. Brown has completed his third tour of operational duty as squadron gunnery leader. His targets have included objectives both in Germany and the Middle East. On one occasion he destroyed two Italian aircraft during one operational sortie. His courage, determination and efficiency have in no small measure contributed to the success of the squadron.

Flt. Lt. A. J. CARRINGTON, D.F.C., R.A.F.V.R., No. 225 Sqn.—This officer has served in both Coastal and Bomber Commands. He has taken



Badge of Middle East Communication Squadron, R.A.F.—"We Travel the Horizons."

Badge of No. 342 (French) Squadron, R.A.F.—"Nous y Sommes" (We Are There).

part in attacks against some of the enemy's most heavily defended targets and achieved many excellent results. An outstanding pilot, Flt. Lt. Carrington has consistently displayed a high degree of courage and determination, and has never let either adverse weather or enemy opposition deter him from completing his allotted tasks. On two occasions this officer has skilfully flown his aircraft safely back to base after it had been severely damaged by enemy action.

Flt. Lt. C. DODSON, D.F.C., R.A.F.V.R., No. 582 Sqn.—Flt. Lt. Dodson is an air bomber of outstanding ability who throughout his operational career has maintained an exceptionally high standard of accuracy. Many of his sorties have been against the most heavily defended targets in Germany and the occupied territories. He has at all times displayed great courage and unswerving devotion to duty.

Flt. Lt. J. T. EDWARDS, D.F.C., R.A.F.V.R., No. 12 Sqn.—This officer has a long record of operational flying and has participated in three tours of duty. Throughout he has displayed an outstanding fighting spirit and fearless courage in air combat. As squadron gunnery leader, his zeal and energy, both in the air and on the ground, have set an inspiring example to the gunners in his squadron. At all times Flt. Lt. Edwards has shown courage, determination and unselfish devotion to duty.

Flt. Lt. L. G. FOLEY, R.A.F.V.R., No. 83 Sqn.—Flt. Lt. Foley has served in both the Middle East and European theatres of war. As an air bomber and set operator he has consistently shown outstanding ability. He has always displayed cool courage and resolution in the face of the enemy. On one occasion in April, 1944, Flt. Lt. Foley's aircraft was badly damaged by enemy action and the equipment rendered unserviceable. With great skill he guided his pilot in visually and the attack was successfully completed. Later this officer's aircraft was shot down over France, but he evaded capture and fought with the Maquis until able to resume operational flying again.

Flt. Lt C. HASSALL, D.F.C., R.A.F.V.R., No. 142 Sqn.—This officer commenced operational flying in August, 1940. Since then he has flown on a large number of sorties, many against the most heavily defended targets in Germany including Berlin on 26 occasions. An excellent navigation leader, he has consistently displayed a high degree of courage, skill and devotion to duty.

Bar to Distinguished Flying Cross

Wing Cdr. D. A. CRACKNELL, D.S.O., D.F.C., R.A.F.V.R., No. 7 Sqn.
Act. Sqn. Ldr. G. BOND, D.F.C., R.A.F.V.R., No. 10 Sqn.
Act. Sqn. Ldr. J. D. MELROSE, D.F.C., R.A.F., No. 9 Sqn.
Act. Sqn. Ldr. G. H. WHOWELL, D.F.C., R.A.F.V.R., No. 166 Sqn.
Flt. Lt. W. D. AUSTIN, D.F.C., R.A.F.V.R., No. 214 Sqn.
Flt. Lt. F. BALDWIN, D.F.C., R.A.F.V.R., No. 571 Sqn.
Flt. Lt. T. BELL, D.F.C., R.A.F.V.R., No. 109 Sqn.
Flt. Lt. M. B. BENNETT, D.F.C., R.A.F.V.R., No. 102 Sqn.
Flt. Lt. R. B. BIRCHMORE, D.F.C., R.A.F.V.R.
Flt. Lt. K. W. BIRT, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. L. J. B. BUCKLEY, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. C. R. A. CHALLIS, D.F.C., R.A.F.V.R., No. 105 Sqn.
Flt. Lt. F. G. DAVY, D.F.C., R.A.F.V.R., No. 109 Sqn.

Distinguished Flying Cross

Flt. Lt. L. C. MOFFATT, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
Flt. Lt. A. N. MONTGOMERY, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
Flt. Lt. W. W. OSBORN, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Flt. Lt. G. W. PERCIVAL, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Flt. Lt. C. L. PITU, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
Flt. Lt. D. O. PRATT, R.C.A.F., No. 150 Sqn.
Flt. Lt. G. S. QUINN, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Flt. Lt. W. McI. ROBERTS, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Flt. Lt. J. W. ROTHENBUSH, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. C. H. SHORT, R.C.A.F., No. 105 Sqn.
Flt. Lt. D. E. TARLING, R.C.A.F., No. 77 Sqn.
Flt Lt. A. E. WINMILL, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
Act. Flt. Lt. C. T. ALGER, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Act. Flt. Lt. G. W. ARCHER, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
Act. Flt. Lt. G. S. BAKER, R.C.A.F., No. 582 Sqn.
Act. Flt. Lt R. F. BERTRAN, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Act. Flt. Lt. F. C. CLEGG, R.C.A.F., No. 51 Sqn.
Act. Flt. Lt. A. G. COOKE, R.C.A.F., No. 77 Sqn.
Act. Flt. Lt. J. G. R. COOKE, R.C.A.F., No. 101 Sqn.
Act. Flt. Lt. W. B. EDMONDS, R.C.A.F., No. 90 Sqn.
Act. Flt. Lt. W. C. FODERINGHAM, R.C.A.F., No. 166 Sqn.
Act. Flt. Lt. D. GRIFFIN, R.C.A.F., No. 158 Sqn.
Act. Flt. Lt. R. G. KANE, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Act. Flt. Lt. A. E. L. MORRIS, R.C.A.F., No. 223 Sqn.
Act. Flt. Lt. W. J. MULHOLLAND, R.C.A.F., No. 166 Sqn.
Act. Flt. Lt. W. O. NOBES, R.C.A.F., No. 100 Sqn.
Act. Flt. Lt. E. R. SMYTH, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Act. Flt. Lt. S. P. SORENSON, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. F. VIPOND, R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Act. Flt. Lt. K. A. WHYNACHT, R.C.A.F., No. 150 Sqn.
F/O. W. W. ALDERDICE, R.C.A.F., No. 550 Sqn.
F/O. R. T. ANDERSON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. R. M. ARMITAGE, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O O. M. BACHINSKI, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
F/O. J. A. BACON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. J. A. BEALE, R.C.A.F., No. 550 Sqn.
F/O. L. G. H. BENNETT, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
F/O. W. M. BRADSHAW, R.C.A.F., No. 138 Sqn.
F/O. J. BROWN, R.C.A.F., No. 4666 (R.A.A.F.) Sqn.
F/O. W. R. BUMSTEAD, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. C. L. CARLSON, R.C.A.F., No. 156 Sqn.
F/O. Y. K. CARTER, R.C.A.F., No. 35 Sqn.
F/O. H. W. CATHREA, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. R. A. COPE, R.C.A.F., No. 103 Sqn.
F/O. R. E. F. CROSSEY, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
F/O N. DEMARCO, R.C.A.F., No. 76 Sqn.
F/O. G. BENBEIGH, R.C.A.F., No. 153 Sqn.
F/O. H. H. FARMER, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
F/O. K. R. FEE, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. A. M. FOTHERINGHAM, R.C.A.F., No. 426 (R.C.A.F.) Sqn.

Distinguished Flying Medal

Flt. Sgt. H. T. ANSELL, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. (now P/O.) M. J. BELL, R.A.F.V.R., No. 157 Sqn.
Flt. Sgt. A. H. COOPER, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. G. A. MITCHELL, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. C. H. REES, R.A.F.V.R., No. 462 Sqn.
Flt. Sgt. C. F. TURNER, R.A.F.V.R., No. 186 Sqn.
Sgt. F. DENNIS, R.A.F.V.R., No. 419 (R.C.A.F.) Sqn.
Flt. Sgt. F. R. HAMILTON, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Flt. Sgt. F. G. RIDLEY, R.C.A.F., No. 433 (R.C.A.F.) Sqn.
Flt. Sgt. W. H. WADDELL, R.C.A.F., No. 420 (R.C.A.F.) Sqn.
Flt. Sgt. A. M. CASSIGNOL, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. A. S. CUBBERLEY, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. F. DOCKAR, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. (now W/O.) K. R. FINCH, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. K. A. P. FOSSIT, R.A.F.V.R., No. 139 Sqn.
Flt. Sgt. D. J. FOWKES, R.A.F.V.R., No. 576 Sqn.
Flt. Sgt. J. MacG. FRASER, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. R. N. HOARE, RA.F.V.R., No. 582 Sqn.

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil.)

F/O. J. A. H. GOTT, G.M., R.A.F.V.R.
F/O. O. C. GREBBY, R.A.F.V.R.

B.E.M. (Mil.)

Cpl. R. G. FORSTER, R.A.F.
Cpl. L. J. D. FRISWELL, R.A.F.V.R.
L.A/C. F. P. BROWN, R.A.F.V.R.
L.A/C. W. E. THAXTON, R.A.F.V.R.
Act. Flt. Sgt. H. SIMS, R.A.F.
Sgt. R. BAXTER, R.A.F.V.R.
Cpl. R. M. HARRIS, R.A.F.V.R.
Cpl. E. WINSHIP, R.A.F.V.R.
Cpl. K. J. PAVELIN, R.A.F.V.R.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations conferred upon the officers indicated in recognition of valuable services rendered in connection with the war:—

Conferred by the President of the United States of America

Legion of Merit, Degree of Commander

Air Vice-Marshal T. J. KELLY, C.B.E., M.C., R.A.F.
Air Vice-Marshal L. M. ISITT, C.B.E., R.N.Z.A.F.
Air Comdre. M. W. BUCKLEY, R.N.Z.A.F.

R.A.F. WAR COMMANDERS

Air Chief Marshal Sir Sholto Douglas

Caricature portrait by Hayden

AIR CHIEF MARSHAL SIR SHOLTO DOUGLAS, K.C.B., M.C., D.F.C., has all through his career been a prominent officer of the Royal Air Force. Like so many other senior officers of the Air Force, he started his fighting career in the Army. In August, 1914, he was commissioned in the Special Reserve of the Royal Field Artillery, but in January of the next year he was seconded to the Royal Flying Corps as an observer. In July, 1915, he qualified as a pilot, and in time made a great name for himself as a fighter. Not merely courageous and skilful, he used his brains, and his opinions are more than once quoted in the official history of the war in the air, 1914-18.

In the inter-war years he passed through the R.A.F. Staff College at Andover, and later took a course at the Imperial Defence College, where he presently became an instructor. After these experiences he was well qualified for high command.

During the 1939-45 war Douglas has held a number of the highest posts—those which go with the title of Air Officer Commanding-in-Chief. He has been at the head of Fighter Command, Coastal Command, and the Middle East. Now he is in charge of the Air Force of Occupation in Germany.

Sholto Douglas commanded Coastal Command at the time of the invasion of Normandy. It was the duty of this Command and the Navy to stop the U-boats from the Biscay ports from attacking the Allied shipping. The patrols were organised with such skill that the U-boats hardly ventured to come up.

SERVICE AVIATION

Legion of Merit, Degree of Legionnaire

Air Comdre. G. N. ROBERTS, R.N.Z.A.F.

Legion of Merit, Degree of Officer

Act. Air Vice-Marshal J. A. STONE, C.B., R.A.F.
Act. Air Comdre. F. WOOLLEY, O.B.E., D.F.C., R.A.
Act. Group Capt. H. P. BROAD, D.F.C., R.A.F.
Wing Cdr. H. SHARPE, R.A.F.V.R.
Wing Cdr. S. C. WOOD, R.A.F.V.R.
Act. Wing Cdr. G. W. NEWMAN, R.A.F.V.R.

Bronze Star Medal

Group Capt. C. R. RICHDALE, C.B.E., R.A.F.
Group Capt. A. M. RODGERS, R.A.F.

Air Medal

Sqn. Ldr. M. J. HERRICK, D.F.C. (since deceased).
F/O. D. J. FUFE, R.N.Z.A.F.
F/O. F. G. MACKENZIE, R.N.Z.A.F.
F/O. A. R. MILLER, R.N.Z.A.F.
F/O. R. L. SHUTTLEWORTH, R.N.Z.A.F.
F/O. B. W. WILLIAMS, R.N.Z.A.F.
P/O. H. CLARK, R.N.Z.A.F.
P/O. C. M. O'NEIL, R.N.Z.A.F.
P/O. R. A. WEBER R.N.Z.A.A.F.

Roll of Honour

Casualty Communiqué No. 554.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 240 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Flt. Sgt. L. Bellwood; Sgt. A. Bennett; Sgt. T. F. Carman; W/O. B. Cartmel; Flt. Sgt. T. P. Collier; F/O. G. M. Davies; Sgt. E. G. Ewington; Sgt. P. L. Fox; Flt. Sgt. D. C. Gubbins; F/O. H. R. S. Jacob; Sgt. T. W. Lee; Sgt. J. K. M. McIntosh; Sgt. D. Morrison; P/O. G. L. Scudamore; Sgt. G. J. Sheldon; Flt. Lt. D. S. Spiers; Flt. Sgt. G. B. Valentine; Sqn. Ldr. L. W. Watts, D.F.C.; Flt. Lt. J. Wood; P/O. D. R. Worley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. Armstrong; L.A/C. C. Bottomley; Flt. Sgt. A. Dickson; Sgt. D. W. Evans; P/O. J. S. Fraser-Petherbridge; A/C.2 W. P. Gill; F/O. L. V. Hayes; F/O. B. S. James; F/O. G. F. Jarvis; Flt. Sgt. F. N. Johnson; F/O. W. Oxley; Sgt. N. G. V. Pettit; Flt. Lt. F. J. Reahil, D.F.C.; P/O. C. J. Solly; Flt. Sgt. G. W. Stopford; Sgt. A. Wharton; Sgt. P. Wilding.

WOUNDED OR INJURED IN ACTION.—Sgt. J. Morrison; Sgt. F. Thornton.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. R. S. Clark; F/O. K. Norman; Flt. Sgt. G. R. Willerton.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. E. Pearson; Flt. Sgt. R. D. Speak.

MISSING.—Flt. Sgt. A. G. Artus; Flt. Lt. F. J. Barrett; Flt. Sgt. A. T. Bostock; P/O. S. S. Campbell; W/O. R. G. Evans; Act. Sqn. Ldr. E. S. Few; Flt. Lt. P. B. Finlay; F/O. L. G. Hurst; Flt. Sgt. D. M. Perkins; W/O. S. J. Plater; Sgt. D. K. Raikes; Sgt. R. Roberts; Sgt. D. B. N. Stanes; Sgt. E. E. Sykes; Sgt. A. W. Ward; F/O. S. T. Worbey.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—W/O. W. A. Smith.

KILLED ON ACTIVE SERVICE.—W/O. W. Brown; P/O. J. L. Greenwood; Sgt. J. F. Heimsath; Flt. Lt. J. G. Jenkins; F/O. W. McCabe, D.F.M.

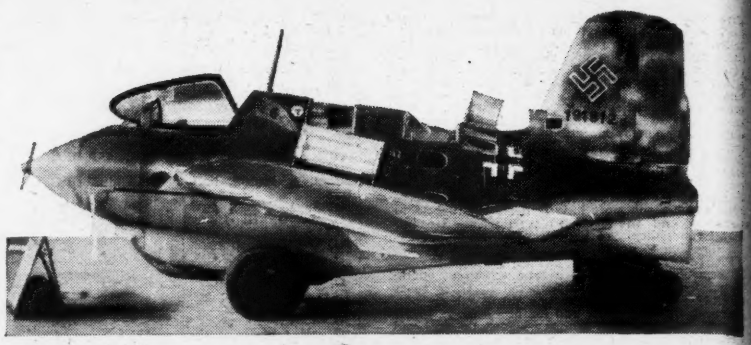
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.1 T. Adams; A/C.1 A. S. Alderson; L.A/C. J. Baker; L.A/C. R. W. Baker; Sgt. J. C. D. Bartlett; L.A/C. R. A. Bates; Sgt. S. G. Bradley; Sgt. P. Bryant; A/C.1 W. C. Butler; Cpl. T. W. Carson; Cpl. R. B. Cathcart; Act. Cpl. F. Cawley; L.A/C. W. Charnley; L.A/C. W. R. Chown; L.A/C. G. H. Colbear; L.A/C. R. F. Cox; Flt. Sgt. G. W. Crawley; Cpl. J. Crean; A/C.1 A. Crofts; Sgt. J. Crompton; L.A/C. B. Davies; L.A/C. E. L. Davies; L.A/C. L. F. Davison; Sgt. K. V. Dean; Sgt. J. F. Dines; L.A/C. W. G. Dodds; L.A/C. A. J. B. Elder; lt. Sgt. J. England; L.A/C. E. D. English; Cpl. E. J. Evans; L.A/C. I. E. Evans; Cpl. W. A. Fallowa; Cpl. G. H. Folkard; L.A/C. C. E. Fraser; L.A/C. K. T. Fuller; Cpl. F. G. Gamble; A/C.1 W. H. Gibbs; A/C.1 A. K. Gilder; Cpl. D. W. Gillard; Sgt. D. J. Gissane; Cpl. W. H. Gomer; A/C.1 J. Grahames; Flt. Sgt. W. H. Green; A/C.1 D. E. Griffiths; Cpl. H. P. Grimshaw; W/O. G. S. Harman; F/O. W. B. Hellon; Cpl. F. T. Hockey; Sgt. G. Hodgkinson; L.A/C. J. A. Holt; Cpl. V. K. Hughes; Sgt. G. W. Hurst; Act. Sqn. Ldr. E. J. Irish; A/C.1 E. V. Irons; Sqn. Ldr. D. H. James; Cpl. M. Kaminsky; L.A/C. A. J. Kendall; A/C.1 R. J. Kerr; L.A/C. J. P. Kinge; Cpl. C. W. Kohn; L.A/C. R. O. Ladbury; L.A/C. K. S. Latham; L.A/C. J. Y. Laurie; L.A/C. W. Lawson; A/C.2 J. Leech; A/C. R. G. Lewis; A/C2 E. Lyth; Sgt. D. McCarthy; L.A/C. A. F. MacDonald; Cpl. J. G. McDonald; A/C.1 C. F. McGonagle; L.A/C. J. A. McGow; L.A/C. A. J. MacGregor; A/C.1 G. McKean; Sqn. Ldr. A. W. McKeeman; L.A/C. L. H. Mace; W/O. H. Mallinson; Cpl. T. N. Mark; L.A/C. G. Marshall; L.A/C. P. Marshall; Sgt. L. S. Martin; Sgt. G. C. Mays; Sgt. J. Mooney; L.A/C. A. J. Moore; L.A/C. F. R. Morrell; A/C. J. Morris; F/O. T. G. Morriss; Cpl. J. T. Mudd; L.A/C. C. Murrell; L.A/C. F. Norris; Sgt. D. H. O'Neill; Cpl. A. Owen, B.E.M.; A/C.2 G. R. Parkes; Cpl. A. C. Parry; L.A/C. I. H. Parsons; Cpl. D. J. Philipson; L.A/C. A. J. Polley; Sgt. J. Provan; L.A/C. D. Raymer; Sgt. V. R. Read; L.A/C. S. P. Rees; L.A/C. L. E. Rigby; A/C.2 J. A. Rodger; L.A/C. T. E. Ruth; Cpl. A. Rutherford; L.A/C. P. Salter; L.A/C. L. Scanlon; Sgt. M. Sedgwick; L.A/C. F. Selway; L.A/C. P. J. Shead; L.A/C. H. Sinton; L.A/C.I. Slack; L.A/C. B. Skillings; L.A/C. W. H. Skinner; L.A/C. W. J. Slater; A/C.2 R. T. Smith; L.A/C. A. E. Spears; L.A/C. E. P. Spence; Cpl. C. J. Spillman; Cpl. J. R. Stirzaker; Sgt. C. H. Stockwell; Sgt. L. R. O. Taylor; A/C.1 W. H. Thomas; A/C.1 F. W. S. Thompson; A/C.1 D. W. Tickle; Cpl. A. Turner; L.A/C. W. H. Walker; L.A/C. P. Wardrobe; L.A/C. A. Weinberg; A/C.2 W. A. Wilcox; L.A/C. S. F. Wilkings; A/C.2 W. S. Williams; L.A/C. G. Witheyman; A/C.1 A. Wood; Cpl. A. W. Wood; Sgt. E. W. J. Young; L.A/C. J. J. Young; A/C.1 W. G. Young.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. P. Clark; L.A/C. E. J. Young.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Cpl. A. C. Day.

DIED ON ACTIVE SERVICE.—Sqn. Ldr. H. R. Birtill; A/C.2 G. H. Brenchley; Cpl. A. Bruce; L.A/C. F. Carr; A/C.1 R. J. Clewley; Flt. Lt. J. H. Corry; L.A/C. J. H. Davies; Cpl. C. Fritchley; Sgt. C. L. Hammond; Cpl. H. S. Hancox; Cpl. A. E. Harmsworth; L.A/C. W. H. Henshaw; L.A/C. W. Houghton; L.A/C. L. Masterman; Cpl. J S Matthew; L.A/C. S. Mellows; Sgt. J. Noble; L.A/C. F. Plumtree; L.A/C. J. W. Rogers; L.A/C. E. Shaw; W/O. H. C. Williams; Act. Flt. Lt. G. Wimpenny; L.A/C. W. Wright.

AIR MARSHAL SIR KEITH PARK recently visited airfields near Hong Kong and addressed officers and men on the subject of demobilisation. He is seen here with Air Comdre. W. A. D. Brook (left).



ODDITY: Perhaps the most unorthodox aircraft used operationally during the war, the Me 163B was never a real success, due to its short range (22 miles after climbing to 40,000ft.), and the fact that it became uncontrollable at just below 600 m.p.h.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. M. Leverington.

Royal Australian Air Force

KILLED IN ACTION.—W/O. S. E. Smith; P/O. D. D. Westgarth.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. K. G. Coleman; Flt. Sgt. B. J. Dowling; F/O. W. T. C. Edginton; Flt. Sgt. B. G. Grasby; Flt. Sgt. W. S. Hancock; Flt. Sgt. J. E. T. Kingham; P/O. E. N. Kirkland; P/O. W. J. Lewis; Flt. Sgt. J. T. Ridgway; Flt. Sgt. E. D. Turpie; Flt. Sgt. O. L. Tyte; Flt. Sgt. B. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. L. A. Jackson; W/O. A. D. Miller.

MISSING.—P/O. R. T. Casey; W/O. J. P. Hunt.

Royal Canadian Air Force

KILLED IN ACTION.—P/O. A. J. Cull; Flt. Sgt. R. J. Green; F/O. D. M. Miller; F/O. J. T. Rose; P/O. G. S. Smith.

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. R. I. Sweet.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. E. Allen, D.F.C.; P/O. A. L. Arnell; F/O. R. N. Bartlett; Flt. Lt. E. W. Beattie; F/O. D. G. Biggs; P/O. R. L. Botsford; F/O. H. B. Brett; F/O. R. A. Bromley; F/O. F. H. Bryon; P/O. W. A. Cauthers; P/O. G. W. Chambers; Sqn. Ldr. G. R. Coldrey; Flt. Lt. I. B. Croll; F/O. D. A. Davey; F/O. J. B. Dallyn; F/O. K. H. Davies; P/O. G. A. Dieno; P/O. H. Doggett; Flt. Sgt. J. F. Duns; P/O. R. O. Ellis; F/O. L. C. Flather; W/O. K. M. G. Fleming; F/O. T. E. Frair; F/O. M. H. W. Gee; F/O. A. H. Grange; F/O. R. J. Grigg; Sgt. J. Hamilton; P/O. J. H. Hamilton; Sgt. W. G. Harris; P/O. J. D. Hayes; P/O. M. E. Hayward; F/O. R. W. Hewitt; Flt. Sgt. G. E. Hitchcock; Sgt. J. Hopper; F/O. B. F. Johnson; Sgt. H. C. Johnson; F/O. W. G. W. Johnson; P/O. A. L. Johnston; P/O. D. A. Kelley; P/O. D. I. A. Laurie; F/O. W. C. Leaming; P/O. J. A. McElheran; F/O. D. W. MacFarlane; W/O. J. S. McWilliams; W/O. T. J. Makepeace; W/O. O. J. Mohler; Flt. Lt. R. B. Moore; P/O. W. D. Mullin; P/O. A. R. Mumford; Sgt. G. F. Murphy; Flt. Lt. W. J. B. Murphy; F/O. L. S. Nairn; F/O. W. G. O'Hagan; P/O. G. Parsons; F/O. R. C. Pearson; Sgt. B. J. Profit; Flt. Lt. H. W. Rieger; F/O. J. S. Ritchie; F/O. R. H. Rolph; Flt. Sgt. M. A. Saruk; P/O. J. C. Seely; P/O. D. D. Skingle; Flt. Sgt. A. E. Smith; Flt. Lt. H. R. Smith; P/O. R. M. Smith; P/O. J. K. Swan; P/O. F. A. E. Tandy; W/O. R. G. Wallace; .F/O. H. A. Wickens; F/O. C. B. Wyckoff.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. W. V. J. Burdis.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. M. C. Hogg; Flt. Sgt. C. H. Livermore; W/O. J. L. Outerson; F/O. J. Ramsay.

MISSING.—Flt. Lt. T. Bell; Flt. Sgt. D. R. H. Curzon; Flt. Sgt. E. W. Hicks; F/O. F. C. Hill; F/O. C. R. M. Morrison; F/O. D. C. Ross; F/O. M. C. Slaughter; P/O. L. L. Slauenwhite; Flt. Sgt. S. J. Teskey; W/O. J. C. Tuplin; Flt. Sgt. C. H. White; Flt. Sgt. R. W. Williams; Flt. Sgt. H. R. Wood.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Lt. H. Nagley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. D. J. Evans; F/O. G. F. Hutchinson; Sgt. R. M. Pitta.

DIED ON ACTIVE SERVICE.—L.A/C. G. E. Matikka.

South African Air Force

KILLED IN ACTION.—Lt. D. C. Cuff; Lt. J. D. Filby; Lt. E. H. Lowe; Lt. K. T. Oakes; Lt. J. A. Topp.

WOUNDED OR INJURED IN ACTION.—W/O. I. N. Brown.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Lt. D. L. Gould.

MISSING, BELIEVED KILLED IN ACTION.—Maj. W. M. P. Mathias.

MISSING.—Lt. F. Bullard.

Indian Air Force

DIED ON ACTIVE SERVICE.—L.A/C. L. Brokefield.